the OIL AND GAS JOURNAL

DECEMBER 3, 1956

Q's AND A's ON TOUGH REFINING PROBLEMS

. . . Question-and-answer session at W.P.R.A. regional meeting reflects today's refining complications p. 104

Richfield Moves In on Choked Files

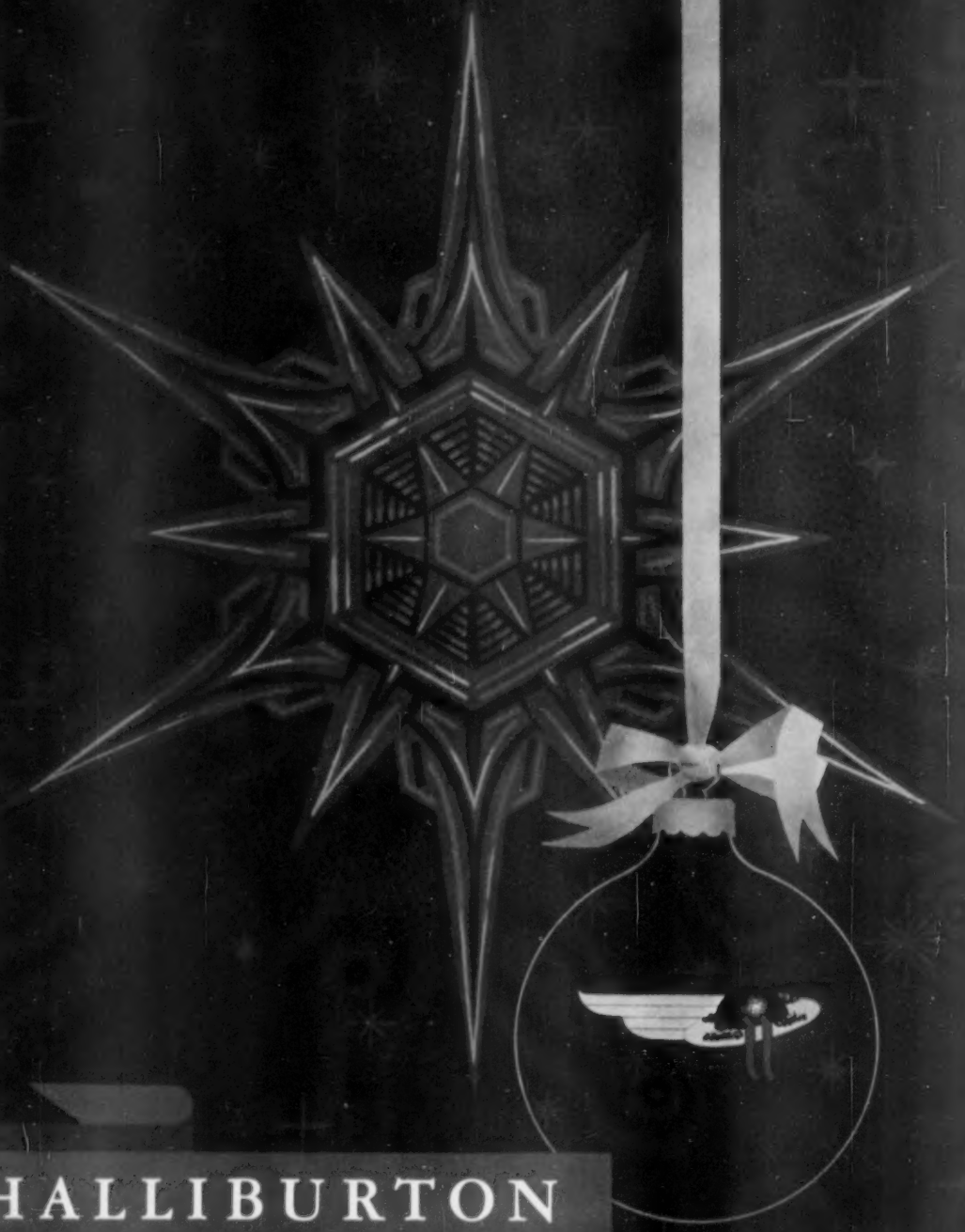
. . . Result: More office space, 90-second reference time. p. 60

Two Big Crude Lines for Middle East?

p. 66

Anadarko Basin Yields Deep Production. p. 172

GREETINGS



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OIL WELL CEMENTING COMPANY

A Glance Ahead . . . at press time

These trends will make TOMORROW'S NEWS

A self-contained pipelaying barge 375 ft. long is on the drawing boards. Brown & Root, Inc., plans to build one to handle the expected upswing in construction in deep water in the gulf.

Usually several barges are hooked together to handle the spread. This is fine for bay and swamp operations, but the method has decided disadvantages in the exposed waters of the gulf.

A new tool for water-flooders may be use of microorganisms to combat sulfate-reducing bacteria. Operators now rely on bactericides to kill bacteria which produce hydrogen sulfide. And the effect of bactericides is so erratic that corrosion and plugging are always threats.

Bacteria seem to develop an immunity to any single treatment. Certain strains of "cannibal" microorganisms may possibly be made to grow in the flood water. There they would eliminate the hydrogen-sulfide producers. A colony established by a large dosage could be maintained by only small later dosages. This treatment has worked in sewage-disposal plants where removal of sulfate reducers cut hydrogen-sulfide odors.

Radioactive tracers will be used more and more in refining as operators overcome lingering doubts about whether they are safe. This reassurance should not be long in coming. The number of refiners using these powerful tools in routine operations is growing.

The tracers can prove or disprove leakage and fix the amount in almost any refining situation. They can determine the amount of entrainment, and they can pin point the degree of mixing, regardless of the mixing problem.

Inland gas fields may benefit from unusually high prices offered for offshore gas. Producers feel the competition for offshore gas could firm the market on land. And they're more optimistic than at any time since veto of the Harris-Fulbright bill.

Some pipeline companies already are said to be matching the 21.4 cents per M.c.f. minimum recently offered by Tennessee Gas Transmission Co. for large offshore reserves.

Drilling activity in Montana will set a new record this year. And another new record can be expected in 1957.

Tests below the Madison in the northeastern part of the state hint at a new deep-drilling era for this section of the Williston basin. Amerada's deep test in Beaver Lodge is being watched closely. Some successes could bring more deep tests quickly.

A new idea for shutting off cavernous loss of circulation is being tried by a West Texas operator. He pumps sand-laden water down the hole, as in a hydraulic-fracturing job, but at lower pressure. The reasoning: When the fluid enters the cavernous zone, it should slow down enough for the sand to drop out, form a bridge, and halt the loss from the well bore. The first trial is described as encouraging but inconclusive.

The OIL AND GAS JOURNAL

DECEMBER 3, 1956 • VOLUME 54 • NUMBER 83

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TECHNOLOGY–OPERATION

Drilling-Production

Offshore Mobile Drilling Units—Today and Tomorrow **91**

By R. J. Howe and B. G. Collipp

Summarized here are the designs produced by 5 years of development of offshore mobile drilling units. Also, here's a look ahead at current trends and potential development of such equipment.

Arkansas's Catesville Field to be Unitized **96**

By Eugene E. Kincaid

Unitization will allow better placement of wells, higher oil recovery, and reduced operating expense. Bromine will be extracted from the produced brine.

Loganalysis—2: Restivity of Fluids **99**

By R. G. Hamilton and Paul Charrin

A summary of the factors that affect mud and water resistivities.

Seven-Way Rotary Valve Streamlines Production Manifolds **122**

By J. O. Scott

This new multiport valve will streamline and cut costs of lease-production installations, and is ideally adaptable to automatic production and testing.

On The Job . . . In The Fields **130**

Refining-Processing

W.P.R.A. Panel: Refiners' Questions and Answers **104**

Edited by Larry Resen

Questions by operating refiners and answers by a panel of authorities from the recent W. P. R. A. regional meeting at El Dorado, Ark. Practical, timely tips on good operating practices.

Steam Plant Uses Distilled Sea Water **131**

By D. H. Stormont

Pacific Gas & Electric Co. is successfully using sea-water evaporators to produce fresh water for boiler operations and other operations at its new Morro Bay steam plant.

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Planning a Microwave Radio Relay System **127**

By R. D. Marsh

Part 2 of a two-part series, dealing with site location, system reliability, equipment considerations, tower-light control, and auxiliary power.

Pipeline Patrol: Compressors Set Pipeline Flow Rate **145**

Part 4 of a four-part series on the use of centrifugal compressors for pipeline operation.

Exploration

Paradox Basin Looks Good To Drillers **102**

By Norman S. Morrisey

This new drilling area is rapidly developing into an important oil province. The basin has had eight discoveries in 1956.

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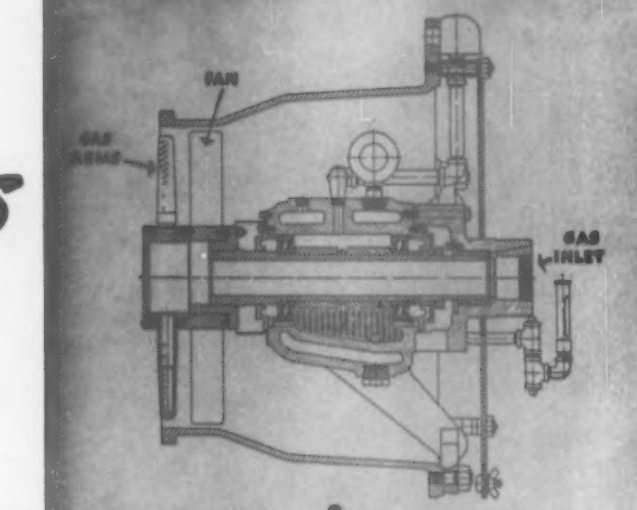

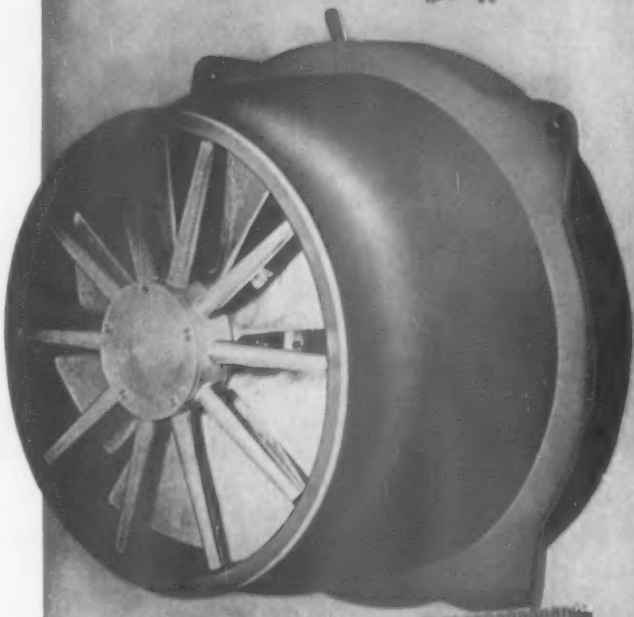

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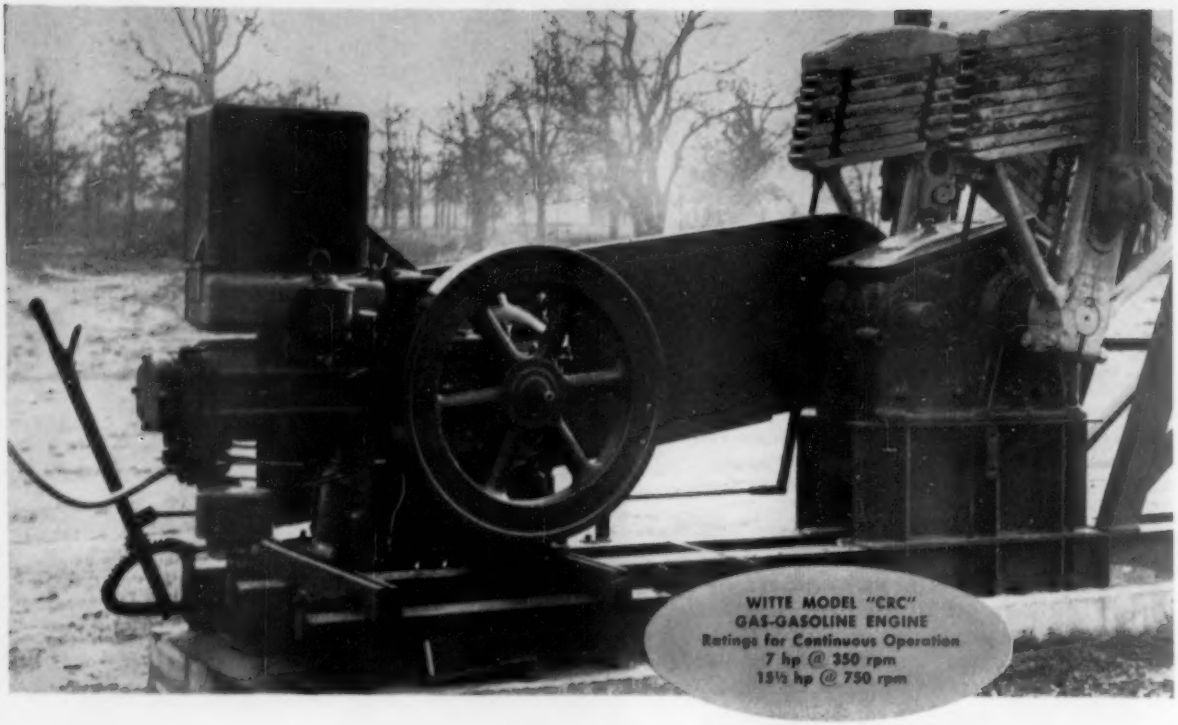

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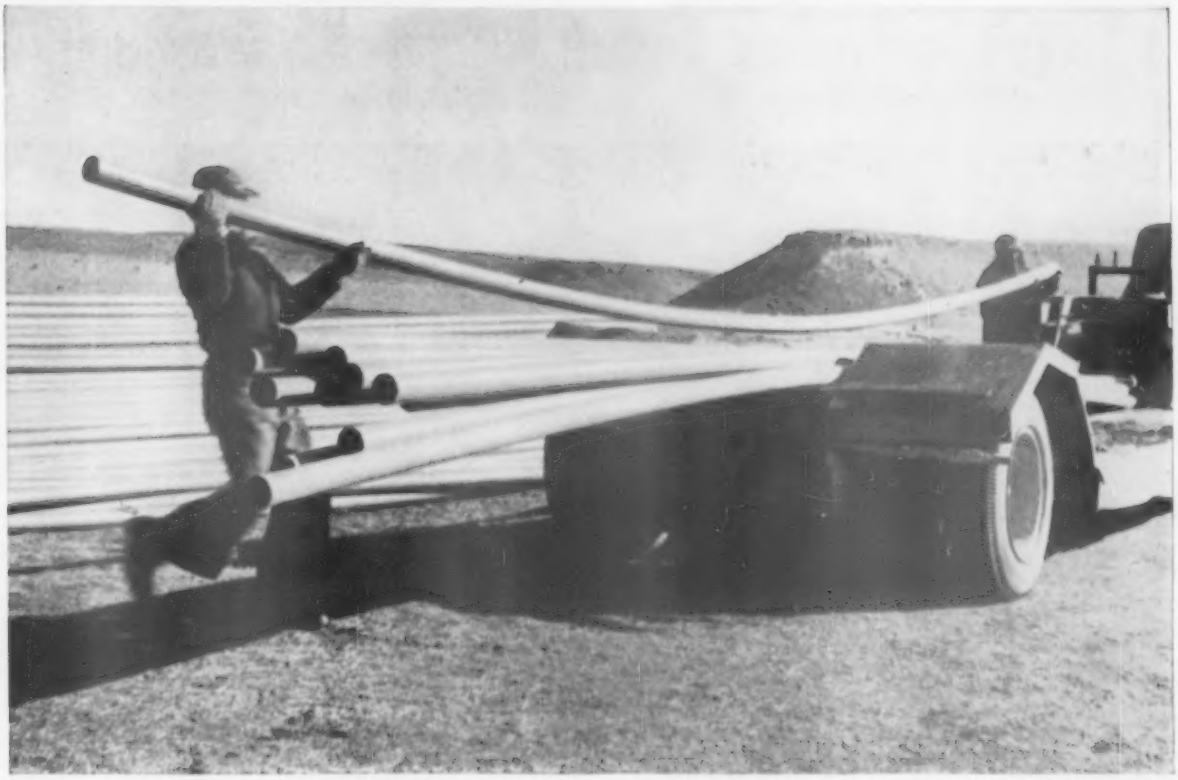

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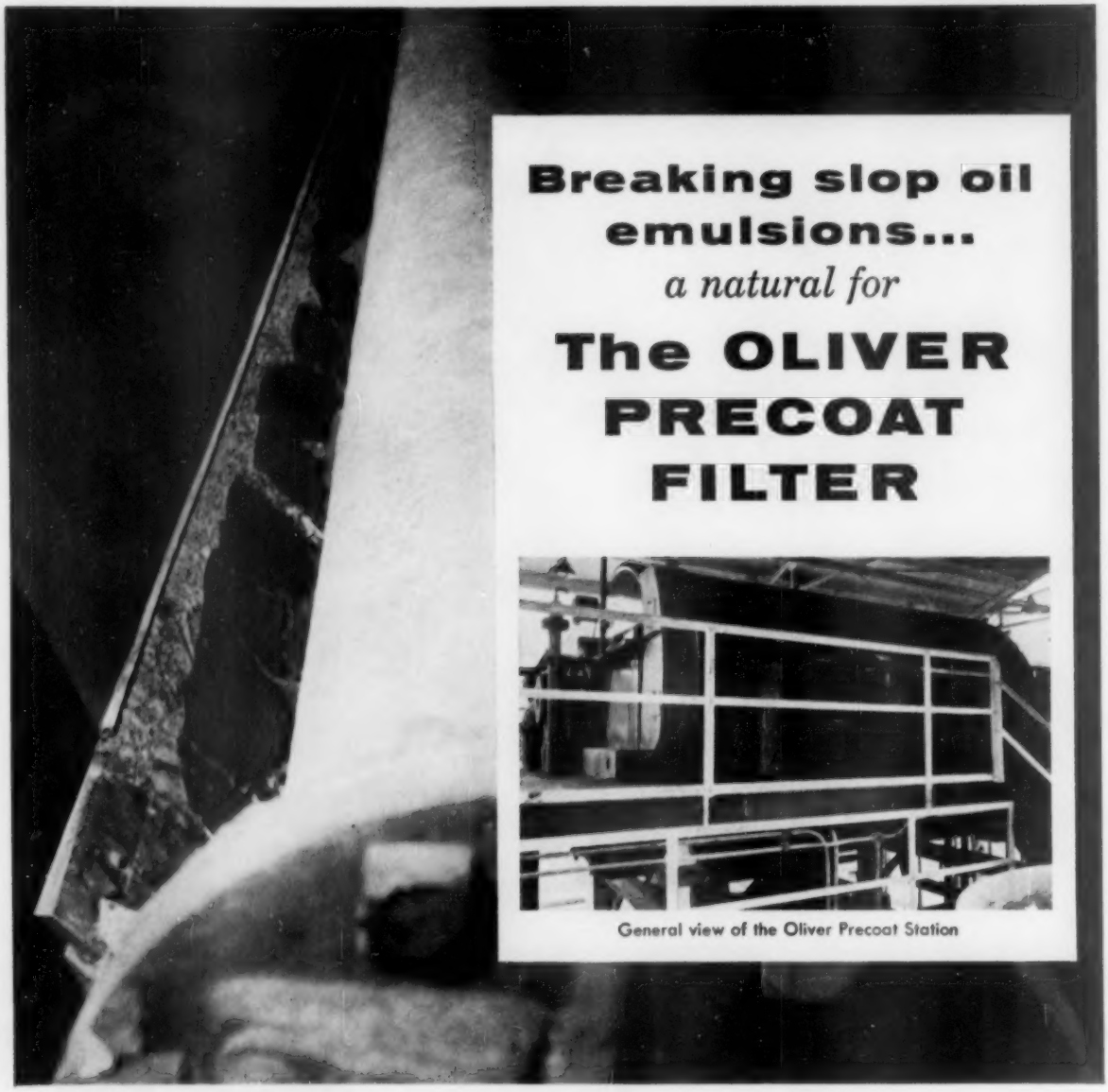

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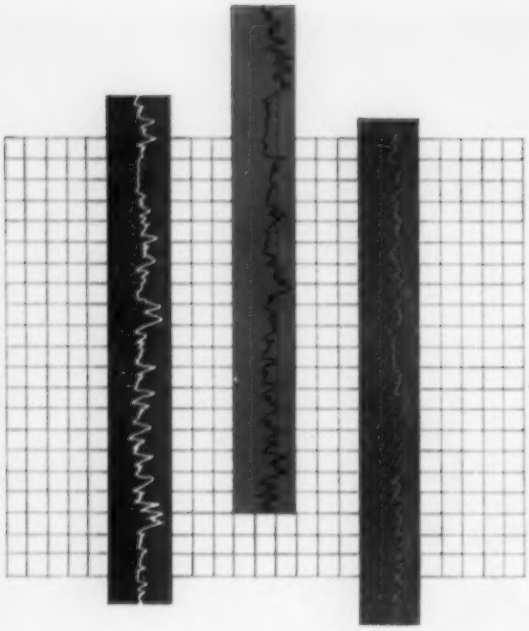

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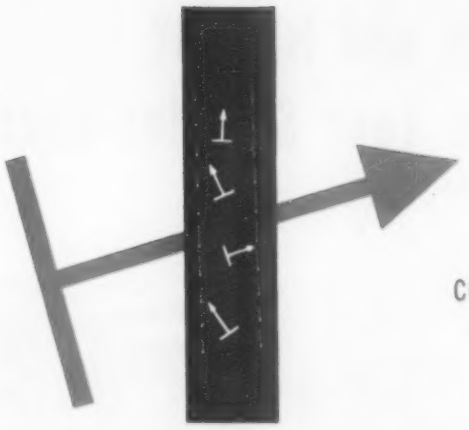
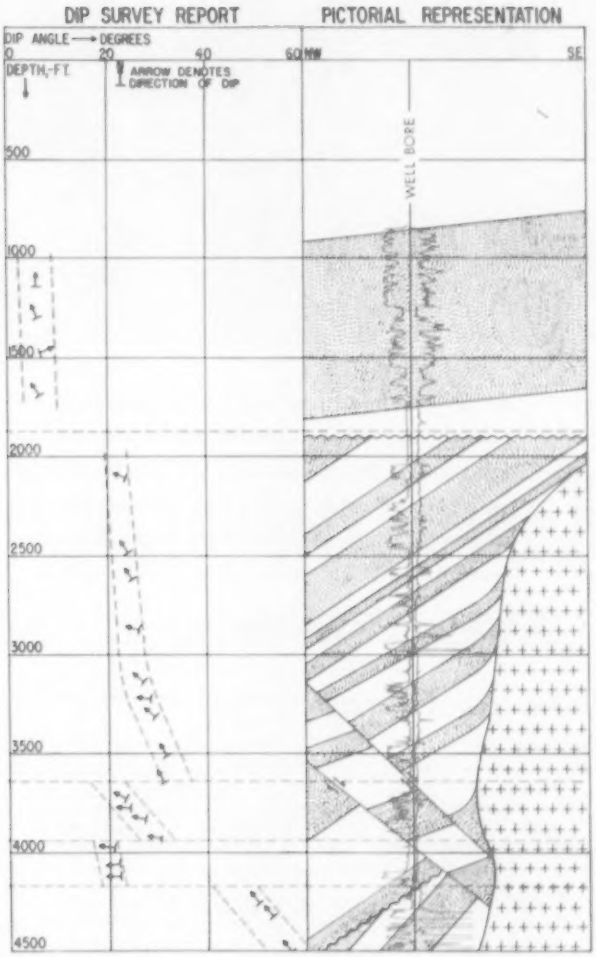


tip-off to oil

CONTINUOUS DIP LOGGING BY HALLIBURTON



Knowledge of where your production zones are trending can usually be obtained from a minimum number of wells with the help of Halliburton's continuous dip logging.

Illustration shows how. Electric log, superimposed in red, guides selection of computational points from dip curves (not shown). Lateral location of each arrow indicates calculated dip angle at arrow's depth. Direction of arrow represents compass direction of dip. Discontinuities (red dotted lines) in dip angle trends (red dotted paths) reveal where faults and unconformities intersect the well bore.

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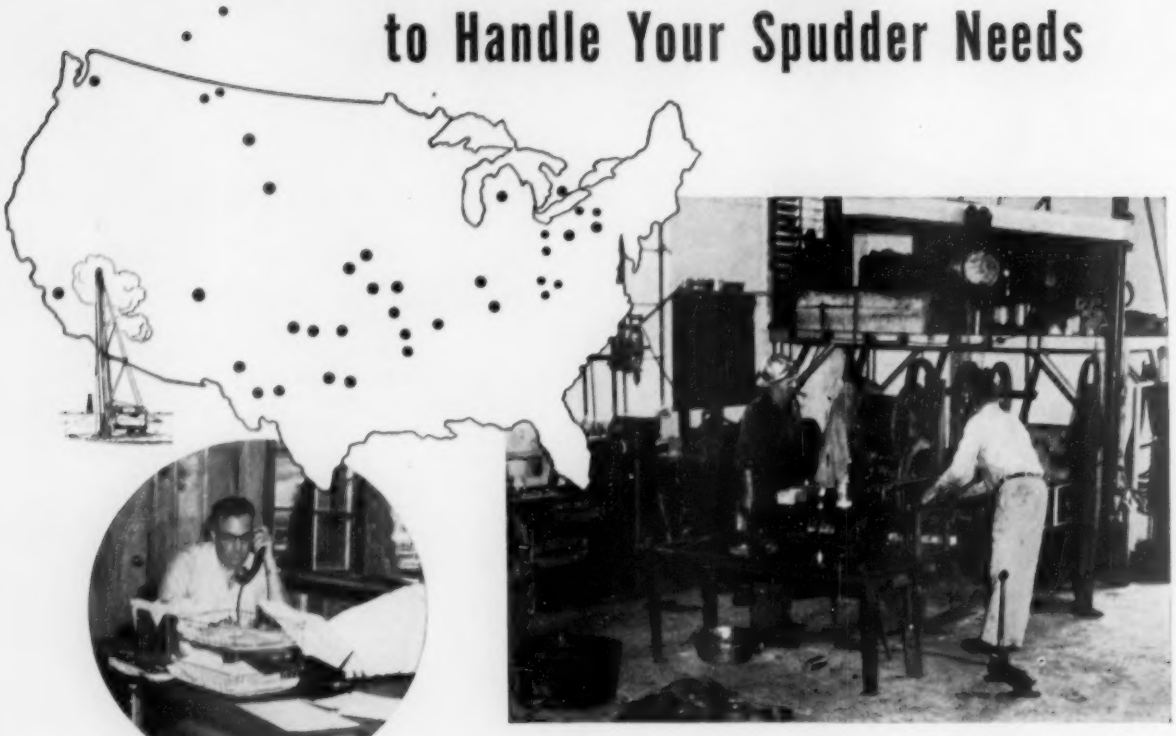
Always Ready, Able and NEARBY to Handle Your Spudder Needs



Here's an up-to-date list of 39 distributor outlets for Bucyrus-Erie spudders, located throughout the United States and Canada in every major oil field. There's a distributor near YOU — *always ready* to fill your equipment needs, *always able* to provide fast, dependable parts, tools and repair service. See him soon and take advantage of his years of field experience, wealth of cost-cutting ideas, and eagerness to satisfy. He's in business to help *you make money* . . . to analyze your drilling problems and to recommend ways *you can solve them*. And you will do BOTH with Bucyrus-Eries.

FIRST with the FINEST in Spudders

Write, Wire or Phone

BEACON SUPPLY CO. . . . . . Pampa and Borger, Tex.
BECKWITH MACHINERY CO. . . Pittsburgh (East Liberty), Erie, Bradford and Clearfield, Pa.
BUCKEYE SUPPLY CO. . . . . . Zanesville and Wooster, Ohio
BUCKEYE SUPPLY CO. OF KANSAS, INC. . . . . . Wichita, Chase, Arkansas City, Great Bend, and El Dorado, Kan.
CABLE TOOL SUPPLY CO. . . . . Princeton, Ind.
DRILLERS SUPPLY CO. . . . . . Joplin, Mo.
DRILLING AND MINING EQUIPMENT CO. . . . . . Los Angeles, Calif.
GREAT NORTHERN TOOL & SUPPLY CO. . . . . . Billings, Cut Bank and Kevin, Mont.; Casper, Wyo.
IVERSON SUPPLY CO. . . . . . Tulsa, Oklahoma City and Okmulgee, Okla.; Ft. Worth, Dallas, Midland, Odessa and Snyder, Tex.; Artesia and Farmington, N.M.
McJUNKIN CORPORATION . . Charleston and Hamlin, W.Va.; Allen and Pikeville, Ky.
OLYMPIC SUPPLY CO. . . . . . Seattle, Wash.
THE STRAKER SUPPLY . . . . . Mt. Pleasant, Mich.

CANADA

LUCEY CANADIAN SUPPLY CO., LTD. . . . . . Calgary and Edmonton, Alba.
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33556

BUCYRUS ERIE

SOUTH MILWAUKEE
WISCONSIN

DISTRICT SALES OFFICES • Atlanta, Ga.
Evansville, Ind. • Dallas, Tex. • Englewood, N.J.

The coatings that, up-to-date, have extended the life of this oil equipment more than 24 times were applied by **Mid-Continent Plastic Co.**, Odessa, Tex.

24 times the service life and still going strong

...that's how the right coating can cut costs

This battery of Texas oil tanks shows a large ¼-in. steel gunbarrel tank in the foreground. It is used to separate salt water from crude oil. Both the salt and the hydrogen sulphide in the oil are highly corrosive.

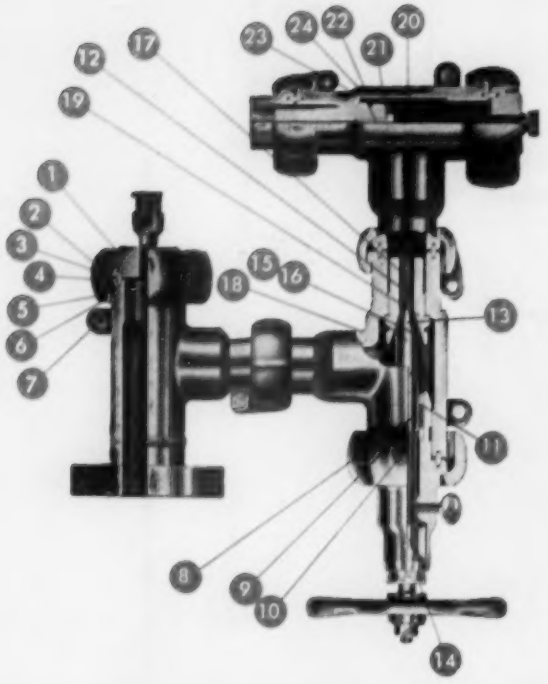
The gunbarrel tank was installed brand new. Within 30 days a hole appeared in its side. This was patched, and noticeable thin spots reinforced. Only 30 days more and leaking began again. Thus, after two months, two alternatives remained – replace the tank or try protective finishes. Coatings based on BAKELITE Brand Vinyl Resins were recommended and applied by spray, after sandblasting. That was over 4 years ago. *No further corrosion trouble has been experienced, and the coating is still in excellent condition.*

Whatever, or wherever your equipment or structure, it can pay *you* to investigate the specialized formulations based on BAKELITE Resins available from many coating suppliers. Call them, or write for a free copy of our booklet, "BAKELITE Resins Coatings for the Petroleum Industry." Address Dept. UK-128.

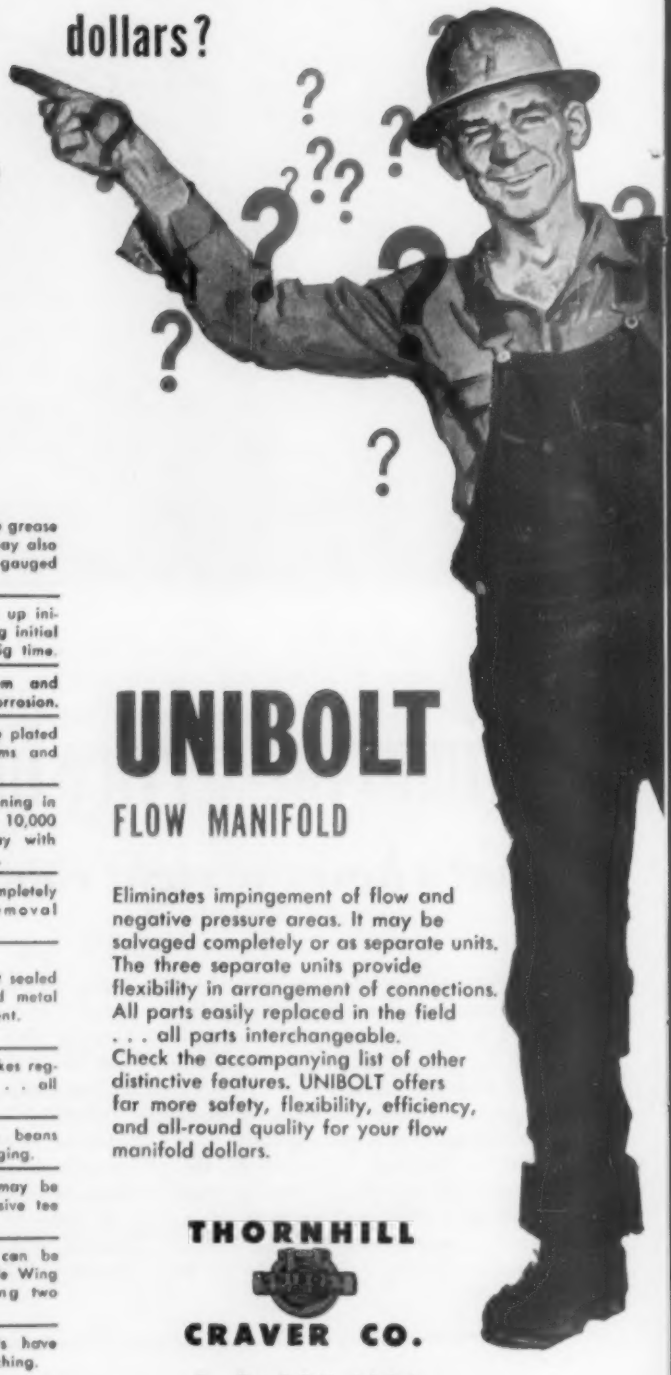
BAKELITE
BRAND
RESINS for COATINGS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N.Y.

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC.



Are you getting all of these important features for your flow manifold dollars?



These are the "Extras" that make UNIBOLT the best buy of all manifolds

1	Tee cannot be accidentally opened.	13	Wing Valve requires no grease to effect a seal . . . may also be used as micrometer-gauged flow bean.
2	No exposed threads . . . no accidental damage.	14	Variable choke speeds up initial clean-up or running initial flow tests . . . saves rig time.
3	Concealed seat in groove . . . no accidental damage.	15	Nitride hardened stem and stem seat . . . resists corrosion.
4	All metal seat . . . not affected by high or low temperature.	16	Choice of hard chrome plated or "SA" stainless stems and seats.
5	Lubricators, bottom hole pressure adapters, and valves easily attached to Unibolt connection.	17	Unrestricted 1" opening in Wing Valve will pass 10,000 bbls. of fluid per day with 100 lbs. pressure drop.
6	2"—3000 lb. wp Unibolt 28% stronger than 2"—ser. 900 flange.	18	Wing Valve can be completely overhauled without removal from tree.
7	Unibolt stronger than tubing threads . . . ideal for working trees with welded lift nipple. Tubing threads in tee if desired.	19	Wing Valve stem seat sealed by power threads and metal gasket assures alignment.
8	Stem packing needs no tightening.	20	Positive Choke Body takes regular or "X" Beans . . . all beans flow-rated.
9	Stem turns freely under high pressures.	21	Shaped entrance on beans prevents paraffin clogging.
10	Threads on stem not exposed to external or internal damage.	22	Positive Choke Body may be replaced with inexpensive tee and cage nipple.
11	Full 2½" pilot for true stem alignment and rigidity.	23	Positive Choke Body can be converted to Adjustable Wing Valve by substituting two parts.
12	Streamlined flow — no obstructions . . . no turbulence.	24	Beans and stem seats have external hex for wrenching.

UNIBOLT

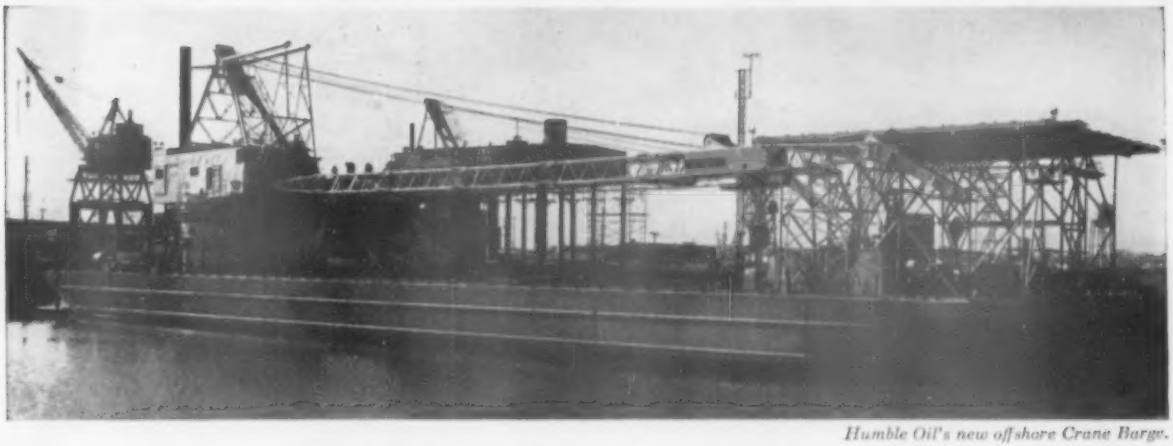
FLOW MANIFOLD

Eliminates impingement of flow and negative pressure areas. It may be salvaged completely or as separate units. The three separate units provide flexibility in arrangement of connections. All parts easily replaced in the field . . . all parts interchangeable. Check the accompanying list of other distinctive features. UNIBOLT offers far more safety, flexibility, efficiency, and all-round quality for your flow manifold dollars.

THORNHILL CRAVER CO.

P. O. BOX 1184
HOUSTON, TEXAS

BETHLEHEM AT BEAUMONT



Humble Oil's new offshore Crane Barge.

New Heavy-Lift Derrick Barge for Offshore Operations

The big crane has a 250-ton capacity.

Humble Oil & Refining Company's new Derrick Barge, "DB-1," was designed to facilitate deep-water oil drilling operations. 300 ft long, 90 ft wide and 19 ft 1-in. in depth, the craft has two revolving cranes mounted on the main deck, one of 250 tons capacity and the other of 40 tons. It is equipped with electric generators, steam boilers, welding apparatus, various construction tools and all necessary deck machinery for mooring. The craft also has a two-level construction foreman's office, an elevated helicopter landing platform and comfortable, air-conditioned crew's quarters for 58 men.

Constructed and equipped by Bethlehem at Beaumont, the "DB-1" is an excellent example of the specialized craft designed and built by this yard for the oil industry.

If you have an offshore problem your *best bet all ways* is Bethlehem at Beaumont. Your inquiries are invited.

A close-up of the two revolving cranes. The smaller unit has a 40-ton capacity.

SHIP REPAIR YARDS

Boston Harbor — New York Harbor
Baltimore Harbor — Beaumont, Texas
Los Angeles Harbor — San Francisco Harbor

SHIPBUILDING YARDS

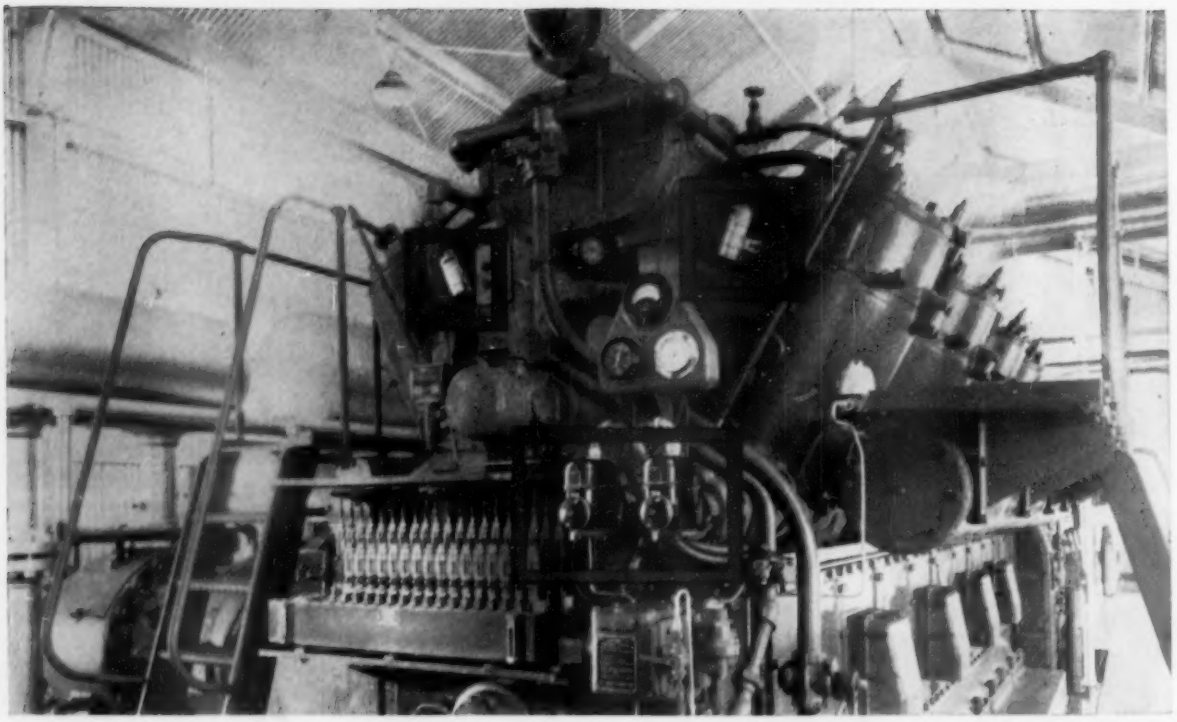
Quincy, Mass. — Staten Island, N. Y.
Sparrows Point, Md. — Beaumont, Texas
Terminal Island, Calif. — San Francisco, Calif.

BETHLEHEM STEEL

Shipbuilding Division

GENERAL OFFICES: 25 BROADWAY, NEW YORK 4, N. Y.

On the Pacific Coast shipbuilding and ship repairing are performed by the Shipbuilding Division of Bethlehem Pacific Coast Steel Corporation



On the Job in the Oil Fields

Cooper-Bessemer Engine and BENDIX MAGNETOS!

A MATCHED IGNITION SYSTEM
High-V Coil
LAR Magneto
Only one electrical connector, the famous Bendix-Scinflex* type, required for all low-tension outlets.

Continuous reliable engine performance is a must in the great oil fields of the Southwest. Pictured above is a Cooper-Bessemer Model GMVA engine equipped with Bendix* LAR type magnetos and HI-V transformer coils at work in a natural gas transmission pipeline station.

This modern LAR Bendix magneto and its companion high-output coil give the kind of reliable ignition that assures constant efficiency at lower operating costs. Reserve power insures smooth running engines, even under the most adverse operating conditions where marginal systems fall down.

The selection by Cooper-Bessemer of this performance proven, matched ignition system is further proof that Bendix—The Most Trusted Name in Magnetos—is more and more becoming the choice of leading engine builders.

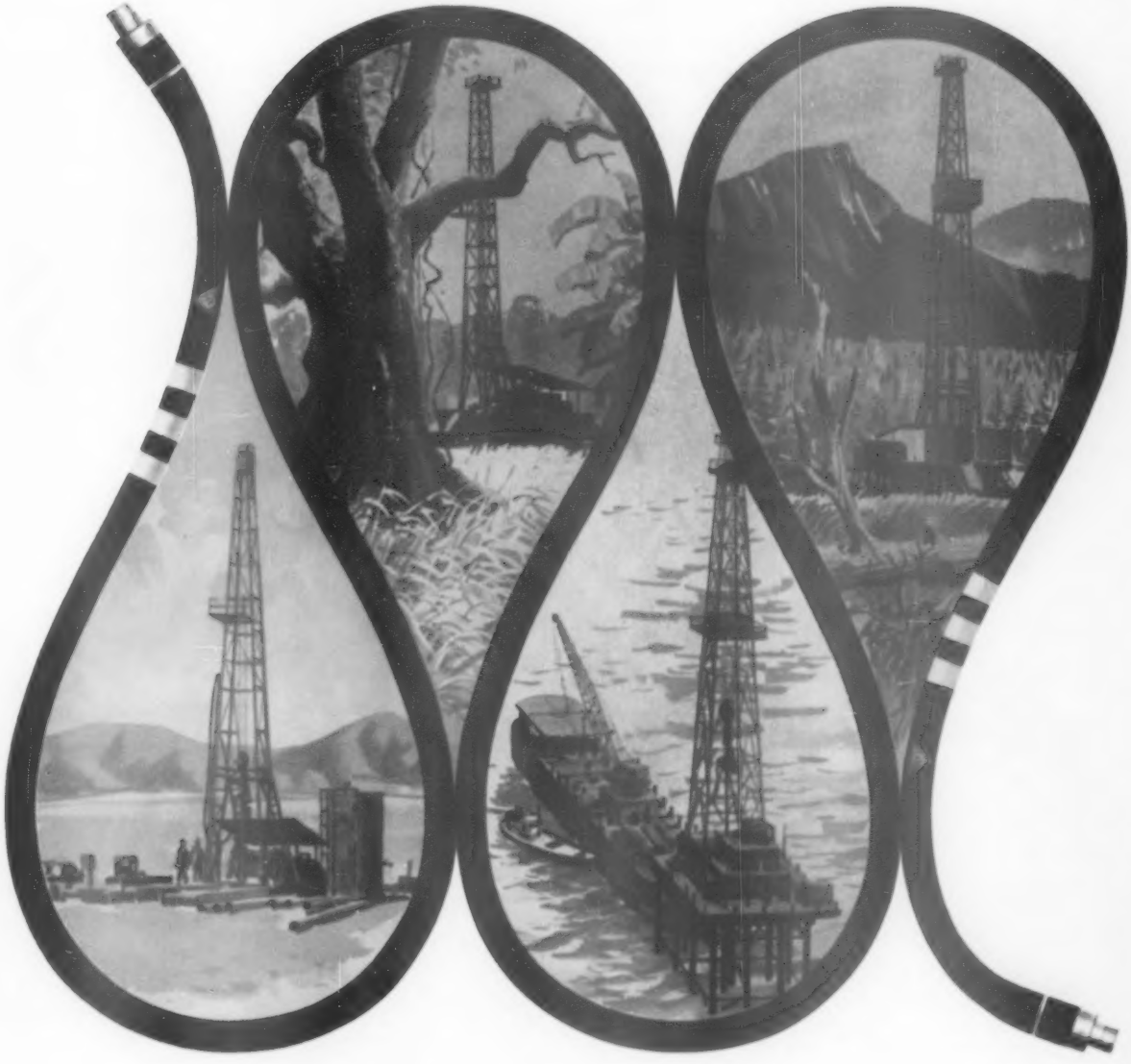
Kits are now available to convert Bendix LA magnetos to the modern LAR type at surprisingly low cost. Complete details are available either from the factory or authorized distributors.

*TRADE MARK

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, SIDNEY, N. Y.

Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.
Canadian Affiliate: Aviation Electric Ltd., 200 Laurentien Blvd., St. Laurent, Montreal 9, Quebec
FACTORY BRANCH OFFICES: 117 E. Providencia Avenue, Burbank, California • 512 West Avenue, Jenkintown, Pennsylvania • Paterson Building, 18038 Mack Avenue, Detroit 24, Michigan • 5906 North Port Washington Road, Milwaukee 17, Wisconsin • Hulman Building, 120 West Second Street, Dayton 2, Ohio • 8401 Cedar Springs Road, Dallas 19, Texas • Boeing Field, Seattle 8, Washington • 1701 "K" Street, N. W., Washington 6, D. C.

Bendix
SCINTILLA DIVISION
Bendix
AVIATION CORPORATION



There's a Green Triangle rotary hose for every application !

NEW YORK BELTING & PACKING CO. Founded 1846

CONTINENTAL SUPPLY COMPANY

A Division of The Youngstown Sheet and Tube Company
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

CONTINENTAL
Serving the Oil and Gas Industries

From the smallest to the largest rigs, there's a Green Triangle Rotary Hose. The greater strength and flexibility of a Green Triangle Hose assures the ultimate in performance. Another advantage: Ready availability . . . through your Continental Store.

Continental Supply Company stocks a complete line of New York Belting & Pack-

serving the industry with the best...

BRODERICK & BASCOM has always brought the industry the best wire rope available with their complete line of Yellow Strand.

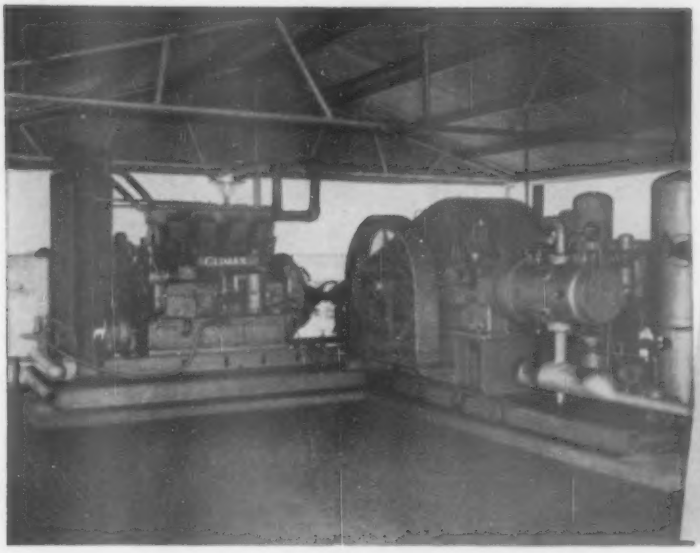
Now available, through your Continental Store, is the latest achievement in wire rope construction... "POWERSTEEL." Its higher strength gives much more in ton-mile service at a small additional investment.

Ask a Continental man about

Yellow Strand® "POWERSTEEL"

CONTINENTAL

Serving the Oil and Gas Industries



One of two Climax V-85 installations at Tex-Penn's Plymouth Field near Corpus Christi, Texas. Engines drive gas compressors on a closed jet system.

A Climax V-85, 8 cylinder, 7½ x 7 engine with 2474 Cubic Inch Displacement.

Climax Engines are

FIELD RECOMMENDED

Mr. F. F. Dueser, Production Superintendent, Tex-Penn Oil Co., Corpus Christi, Texas, states that he is "well satisfied" with his Climax engines. Both V-85 Units operate on a 24-hour per day, 365 day yearly basis and minimum downtime has been encountered since installation. "In addition, my Climax engines give excellent performance, operate at low cost per horsepower and are dependable," comments Mr. Dueser, "and I strongly recommend them for any similar oil field applications."

CHECK THESE IMPORTANT FEATURES OF CLIMAX V AND K SERIES ENGINES

- *All models have renewable cylinder sleeves.*
- *All intake and exhaust valves are free-to-rotate type.*
- *All crankshafts are supported by bearings on each side of each crankthrow.*
- *All connecting rods are rifle drilled for pressure lubrication of piston pins.*
- *All cylinder heads have Climax high-turbulence type combustion chambers which produce maximum fuel economy.*
- *All models have the Climax consistent design that makes possible maximum interchangeability of wearing parts.*

Write today for your copy of Bulletin SA-611, "Special Units for Gas Compressors."

WHERE POWER IS YOUR PROBLEM — CLIMAX IS YOUR ANSWER

climax BLUE STREAK ENGINES

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Drillers Machine Shop, Oklahoma City, Okla.

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General Diesel and Equipment Company (Formerly Sweeney Bros.), Williston, North Dakota

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Wilson's Engine & Equipment Co., Bakersfield & Long Beach, Calif.

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Stewart & Stevenson Services, Inc., Houston and 5 Texas Branches

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Cullander Machinery Co., Belzoni, Miss. & West Memphis, Ark.

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Tobin Machinery Co., Lafayette, La.

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Vern Walton Co., Coolidge, Casa Grande & Marana, Ariz.

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Landes, Zachary and Peterson, Denver, Colo. and 5 Branches

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United Power, Inc. (Formerly United Tool Co.), Shreveport & Alexandria, La.

CLIMAX ENGINE AND PUMP MFG. CO.
208 SO. LA SALLE ST. CHICAGO 4, ILL.
FACTORY • CLINTON, IOWA
DISTRICT OFFICE • 155 CONTINENTAL AVE., DALLAS 7, TEXAS

He can't settle for anything less than A PERFECT SEAL

To the deep-sea diver, anything less than a perfect seal would be a mistake

Likewise, the efficiency of your gas and diesel engines is related to the perfection of a seal—the one formed by the piston rings. Don't *you* settle for less than the seal which is made possible by Pedrick *Formflex* oil rings—the most perfect seal you can get from any piston rings. This is so because of the exclusive Formflex "Equalizer" which provides the utmost in uniformity of pressure, flexibility and conformability. Thus, it meters exactly the right amount of oil to the top rings to assure a perfect seal.

Engineered Sets or open-stock rings, you'll get more efficient performance from top to bottom groove with Pedrick Rings. Pedrick Engineering Service is available to help you with special problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, SAratoga 9-3770.

Pedrick
PISTON RINGS

PEDRICK PRECISIONEERING KEEPS PEDRICK FIRST

THE CALIFORNIA COMPANY, LOUISIANA GULF COAST

DESIGNS, ENGINEERS, and BUILDS COMPLETE
PACKAGED GAS COMPRESSOR PLANTS

Southwest erects complete gas compressor plants: engineering, compressors, barge, building, on one purchase order and with single responsibility from beginning to end. The floating unit shown above was designed, pre-assembled and tested in the Southwest shops, then barge mounted, and delivered complete in 135 days. Southwest does the complete job in building compressor stations afloat, on platforms, or on land giving you faster delivery, lower *installed* cost and undivided responsibility.

The unattended operation, possible with the automatic controls and safety devices on Southwest Packaged Compressor Plants, cuts operating cost per horsepower-hour to a fraction of the cost of a fully attended stationary installation. A Southwest engineer can show you actual comparative operating costs.

FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS

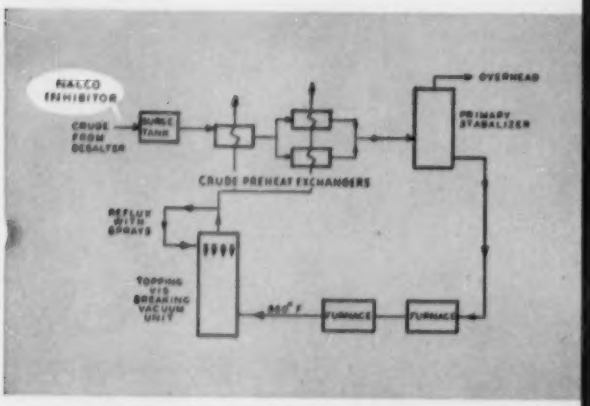
SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773, Houston 7, Texas

Nalco INHIBITORS STOP CORROSION and FOULING

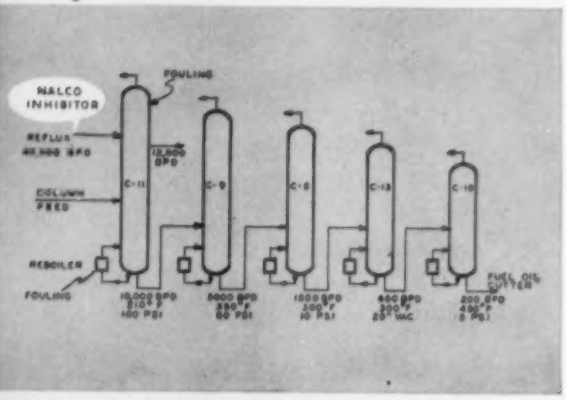
Every Step of the Way

HERE are four typical stages of refinery production where Nalco Inhibitors stop corrosion and fouling. There are many others, too. In fact Nalco Inhibitors are effective every step of the refinery way. Ask your Nalco Representative or write direct.



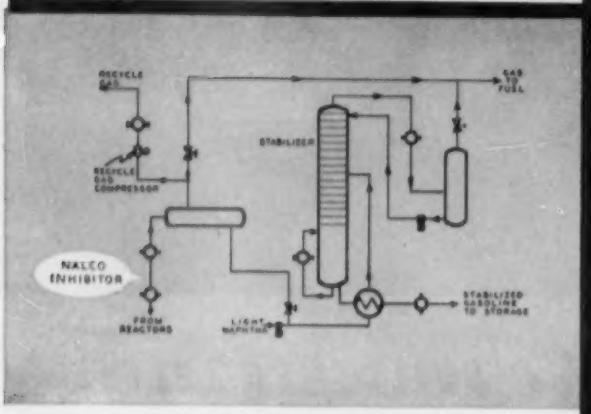
CRUDE PREHEAT EXCHANGERS

The Problem: Fouling. *The Treatment:* 15 ppm of Nalco Inhibitor. *The Results:* Normal temperatures regained in exchangers after five weeks of treatment. Actual reduction of 4 days of downtime due to cleaner condition of treated units.



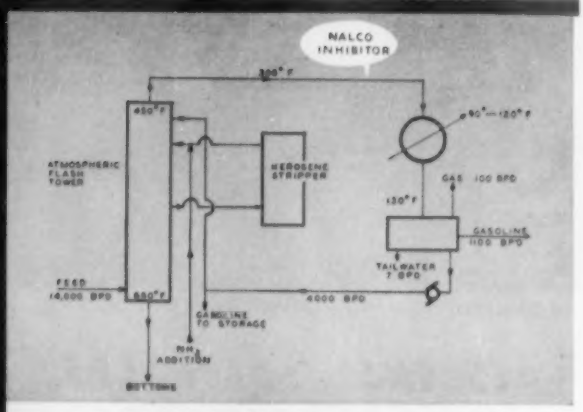
ALKYLATION SYSTEM

The Problem: Reboiler fouling. *The Treatment:* Nalco Inhibitor fed to reflux of tower C-11. *The Results:* No water washing or mechanical cleaning of system needed after full year of operation. Refinery costs and inconvenience reduced considerably. Greater production realized.



PLATINUM REFORMING UNIT

The Problem: Severe corrosion of exchangers and accumulator after the reactors due to an unusually high halogen acid contamination which held pH about 1.3. *The Treatment:* Nalco Inhibitor into reactor effluent. *The Results:* Iron content reduced from 13.9 to low of 0.73 lbs. per day, far lower than with other inhibitors at greater dosage.



DELAYED COKING UNIT

The Problem: Corrosion of overhead condenser, accumulator and stream pumps. Small amounts of iron sulfide "scaling" in flash tower. *The Treatment:* Nalco Inhibitor added to overhead stream. *The Results:* Iron content of tail water reduced from 300-1000 ppm to approximately 1-20 ppm. Corrosion and scaling stopped.

NATIONAL ALUMINATE CORPORATION

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Telephone: POrtsmouth 7-7240
CANADA: Alchem Limited, Burlington, Ontario
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The Flox Company, Inc., Minneapolis 3, Minnesota
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THE Nalco® SYSTEM . . . *Serving Industry through Practical Applied Science*

Baash-Ross **KELLYS**
are first choice because...

Unusually accurate bore due to "Know How" and advanced machining techniques.

Joints are "Hob Cut" to eliminate human error.

Precise machining not only meets but exceeds API specifications.

Each heat of steel checked for quality by separate test specimens.

High physicals insure inherent strength.

BAASH-ROSS makes Kellys in all sizes—all designs (square, hexagon and octagon) and all lengths... plus incorporating the most advanced construction and metallurgical features. No effort is spared to insure you that a B-R Kelly is the very best that money can buy.

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TOOL COMPANY
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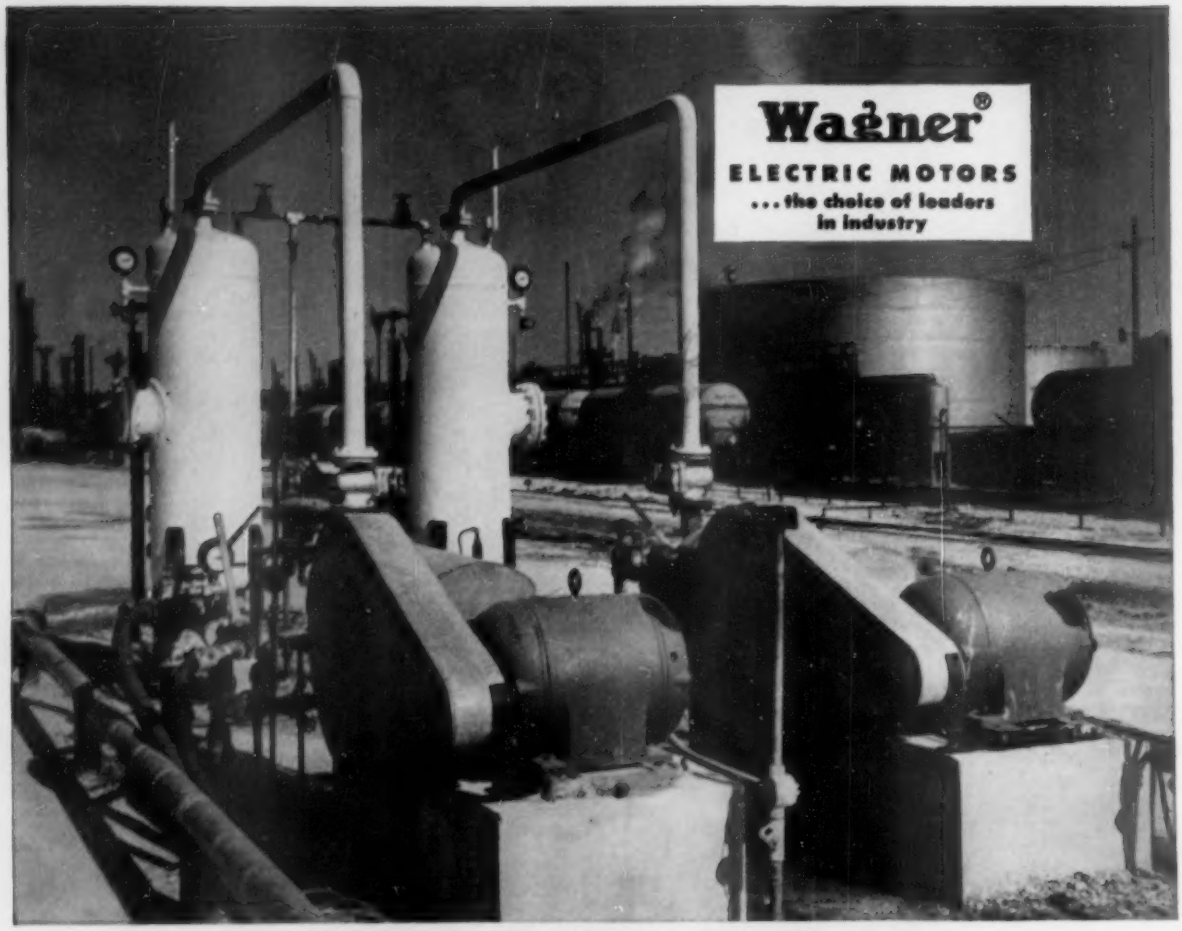
For further information write P.O. Box 1348, Houston 1, Texas or see The Composite Catalog.



Protected against explosion
WAGNER JP MOTORS

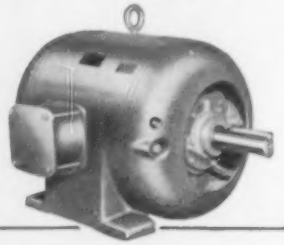
A single spark in a hazardous atmosphere can mean the end of refinery production . . . to say nothing of possible loss of life and millions of dollars in damage from fire and explosion.

Wagner Type JP Explosion-Proof Motors are expressly built for applications in hazardous atmospheres. They're perfect for the job . . . that's why they're the time-tested favorites of the petroleum industry—in pumping stations and in refineries. They are approved by Underwriters' Laboratories for Class 1 Group D hazardous locations. These motors are available in a complete range of ratings through 250 hp, normal torque and high torque.

In addition to these explosion-proof motors, Wagner also manufactures a line of drip-proof 40°C. polyphase motors, in ratings through 75 hp, especially designed for the continuous outdoor service demanded by oil well pumping applications. High power factor type capacitor oil well pumping motors are available for use where single-phase motors are required.

Write for Bulletin MU-132 on Cast Iron Frame Motors and for Bulletin MU-137 on Oil Well Pumping Motors. Thirty-two branch offices are ready to assist you in any motor application problem.

This Wagner Type JP Explosion-Proof, cast iron motor, with frames and end-plates of cast iron, is suitable for indoor or outdoor use and for installations where corrosion is a problem . . . as well as for general applications.



Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M56-3

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

First . . .

George Washington, the first president, was first in war, first in peace and first in the hearts of his countrymen.

Year after year the Texas Employers' Insurance Association continues to be first with employers of labor in Texas, writing more Workmen's Compensation Insurance in Texas than its five principal competitors combined.

One reason for this popularity with Texas industry is the Association's low-cost plan of operation which has enabled it to save and return more than forty-nine million dollars to its policyholders in Texas.

Are you, like others in the Oil and Gas Industry, taking advantage of these SAVINGS?

Over
$49,000,000
Saved and Returned to
POLICYHOLDERS

TEXAS EMPLOYERS
INSURANCE ASSOCIATION

HOME OFFICE • DALLAS, TEXAS

Service Offices: ABILENE • AMARILLO • AUSTIN • BEAUMONT • CORPUS CHRISTI
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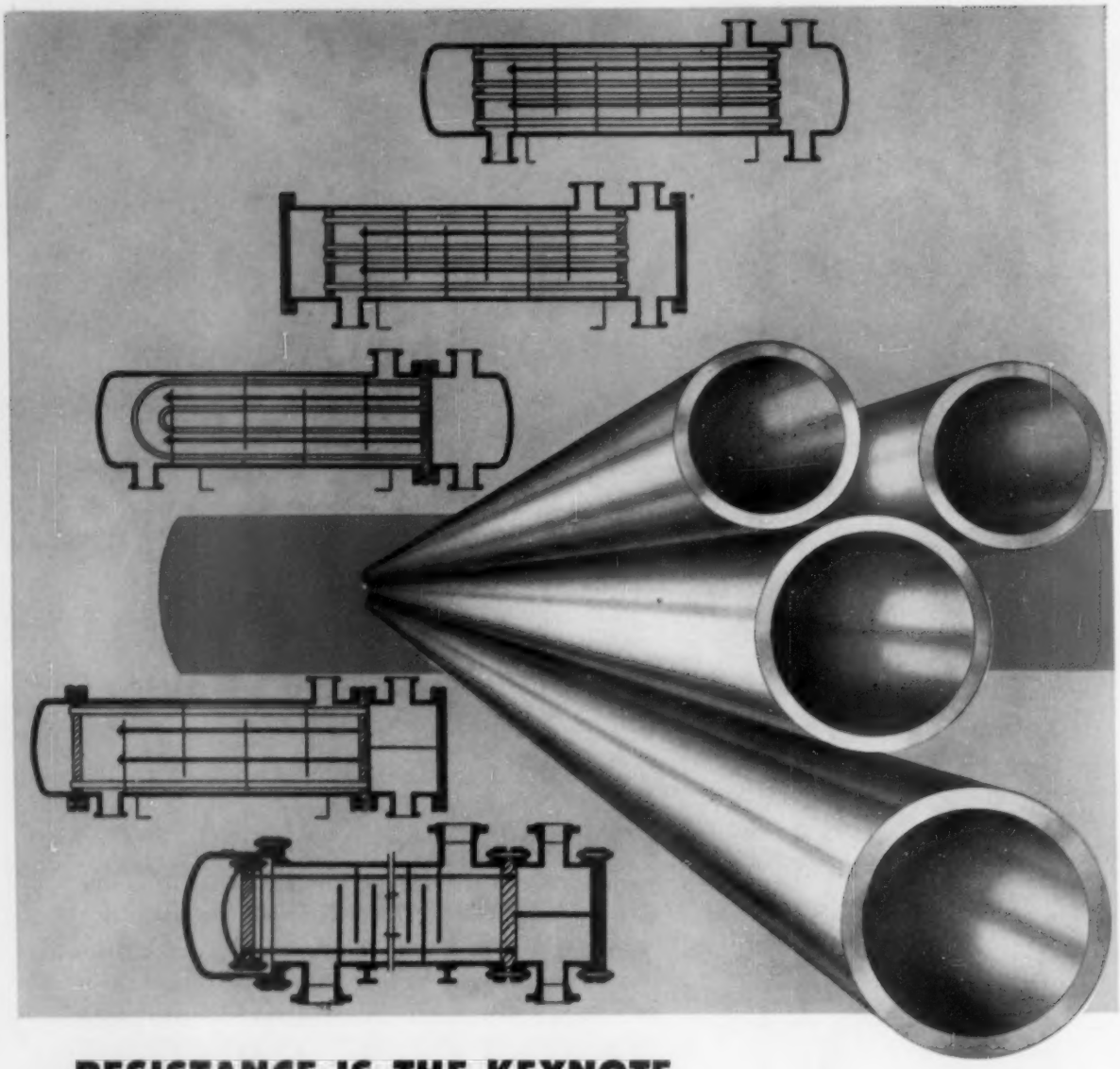
SAN ANTONIO • SHERMAN • TYLER • WACO • WICHITA FALLS

A. F. ALLEN, *Chairman of the Board* BEN H. MITCHELL, *President*



RESISTANCE IS THE KEYNOTE

Resistance to corrosion and contamination of product is the job of B&W Condenser and Heat Exchanger Tubes in the process industries. In myriad processes where resistance to these factors is a major consideration, selection of the best tube steel analysis for optimum performance is of paramount importance in any application.

B&W offers a wide variety of grades, seamless or welded, to meet virtually every requirement, economically and dependably. In addition to designers' preferences, shop men like B&W Tubing because they know from experience that B&W Tubes are easy to bend, to roll in, and to weld.

B&W Condenser and Heat Exchanger Tubes are included in the comprehensive warehouse stocks of many helpful, well-informed independent B&W tubing distributors. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

TA-6098-GP

Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels

This worm had to turn, evenly...

needed, some way to cool off hot-tempered worms!

AFTER the worms were heated and quenched, their threads were not uniform. Distortion had already destroyed the precision machining so vital for efficient operation and long life.

Technicians traced the trouble back to the tempering process. The soft steel had hardened unevenly and warped. The result: crooked worms with uneven tempers.

This is what Texaco did about it . . .

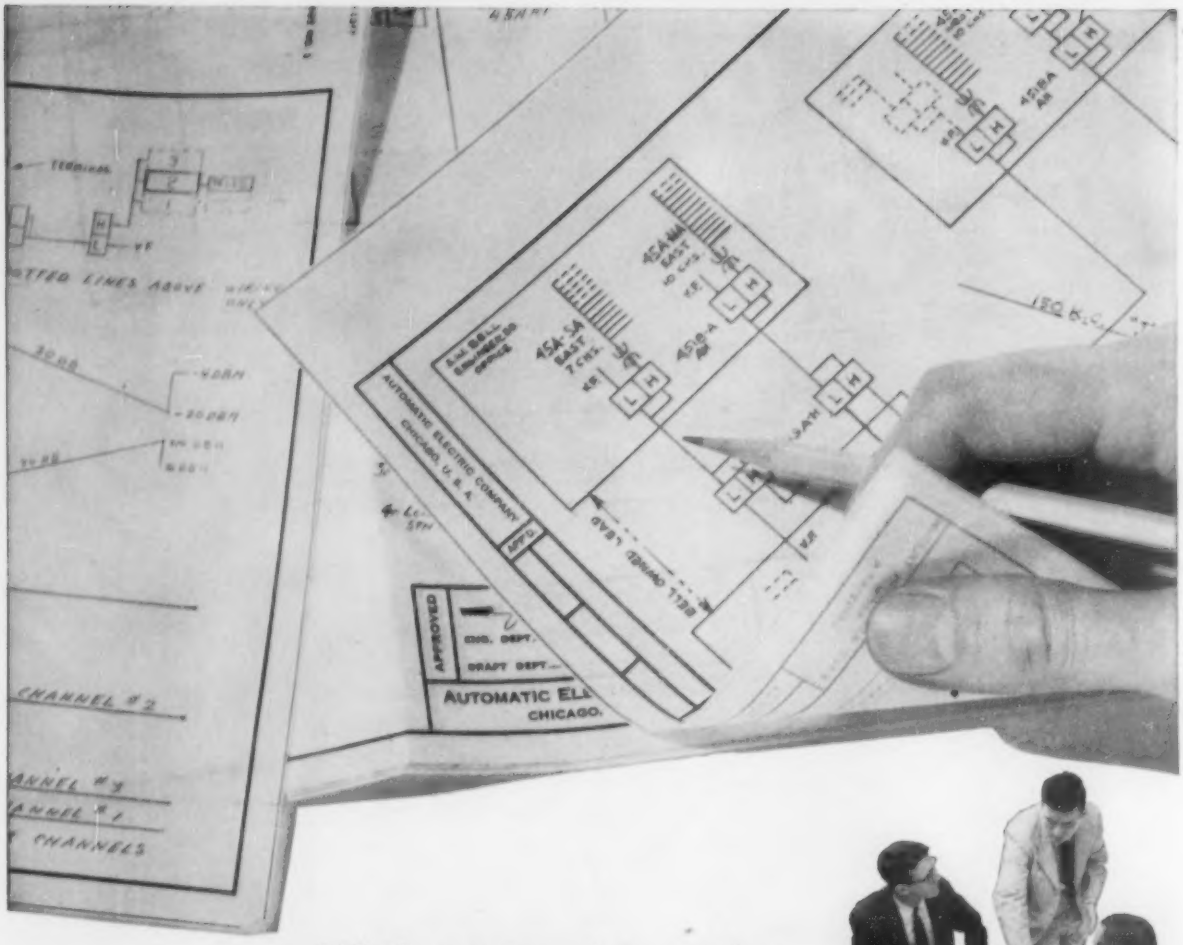
Available quenching fluids were not doing the job. A superior one was indicated. So – Texaco went to work on a tough problem – came up with the answer – a fluid that equalized metal tempering as never before.

Now the hot steel could be quenched uniformly. Result: true and smooth-turning worms with even tempers!

THE TEXAS COMPANY

TEXACO

Texaco Research – always ahead



Lift the mystery from carrier

with Automatic Electric's "PACKAGE PLAN"

Automatic Electric's "Package Plan" makes it easy for you to add carrier equipment in providing the circuits you need, without overloading your engineering and installation staff.

Combined in this "Package Plan" are Lenkurt's "Engineer, Furnish and Install" Service and Automatic Electric's "Follow-Thru" Engineering. Together, these services are all that's required to handle your job—and do it economically.

SPECIFICALLY, HERE'S WHAT WE DO—

Analyze Your Needs. Automatic Electric's "Follow-Thru" engineers study your communications problem and give you a complete over-all plan. If rearrangements are necessary in your present equipment, outside plant, or circuit layout, the most economical way is suggested. The correct carrier equipment for each specific part of the plan is recommended—*and you are told why.* The resulting circuits will function as an integral part of your over-all operations—not as an accessory that is "grafted on" as an afterthought.

Engineer, Furnish, and Install. Each carrier system is engineered to your requirements, pre-assembled, wired and tested by Lenkurt, using the most modern and precise techniques. Lenkurt "E F & I" technicians handle all the details of installation and turn the system over to you, ready to "cut over" for service on the promised date.

Train to Operate and Maintain. Lenkurt engineers will train your men to operate Lenkurt equipment right on the job. They furnish detailed equipment bulletins, line-up and operating instructions, and maintenance techniques.

"Follow-Thru" Engineering always available. Automatic Electric's "Follow-Thru" Engineering Service does not stop with the planning stage, or even with the cut-over; it is available *throughout the life of your Lenkurt Carrier.*

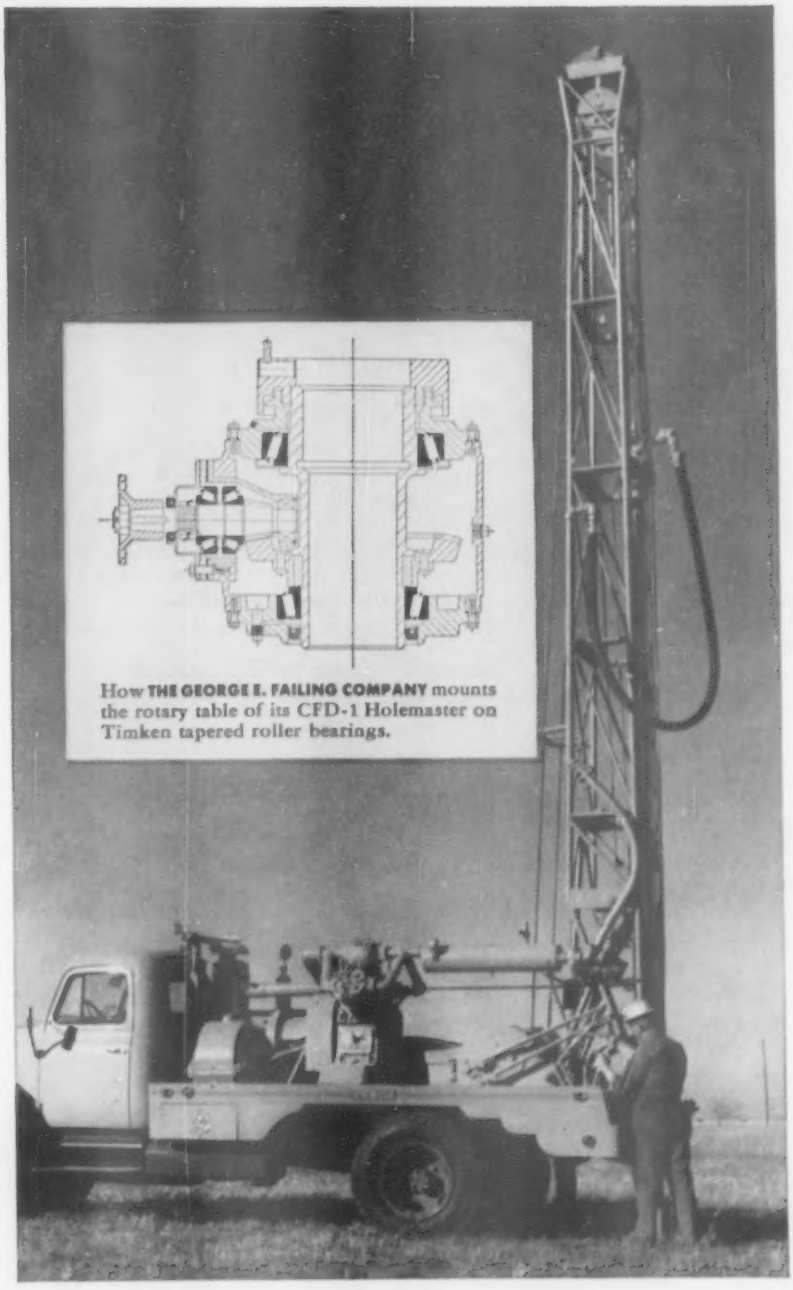
A letter or call will bring an Automatic Electric carrier engineer with all the facts on our "Package Plan". *Write or call* Automatic Electric Sales Corporation, 1033 West Van Buren Street, (HAymarket 1-4300), Chicago 7, Illinois. *In Canada:* Automatic Electric Sales (Canada) Ltd., Toronto. *Offices in principal cities.*

AUTOMATIC ELECTRIC

Originators of the dial telephone • Pioneers in automatic control

GENERAL TELEPHONE SYSTEM

Portable drilling rig keeps on the go, with TIMKEN® bearings in gear case, rotary table and water swivel



How **THE GEORGE E. FAILING COMPANY** mounts the rotary table of its CFD-1 Holemaster on Timken tapered roller bearings.

ENGINEERED for speedy drilling, ease of operation and long life, this George E. Failing Company CFD-1 Combination Holemaster stays on its rugged work schedule with the help of 10 Timken® tapered roller bearings—in bevel gear case, rotary table and water swivel.

Timken bearings hold shafts in rigid alignment, let gears mesh smoothly, reducing wear and keeping maintenance down-time to a minimum. The tapered construction of Timken bearings lets them take radial and thrust loads in any combination. Case-carburized rollers and races—hard, wear-resistant surfaces over tough, shock-resistant cores—meet heavy shock loads. And by carrying the load over full lines of contact, rollers and races provide *extra* load-carrying capacity.

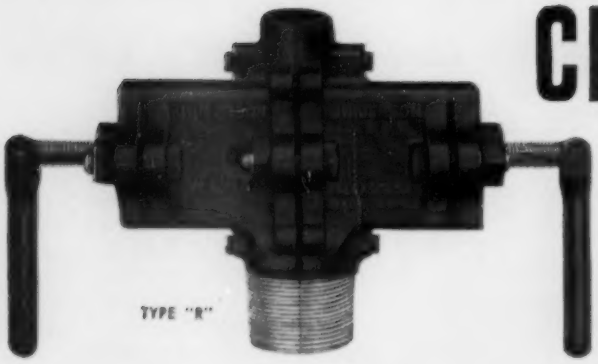
Geometrically designed and precision-manufactured to give true rolling motion, Timken bearings meet rigid quality controls from melt shop to finished bearing. We even make our own fine alloy steel to insure top quality—something no other American bearing maker does. When you buy or build machinery, look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

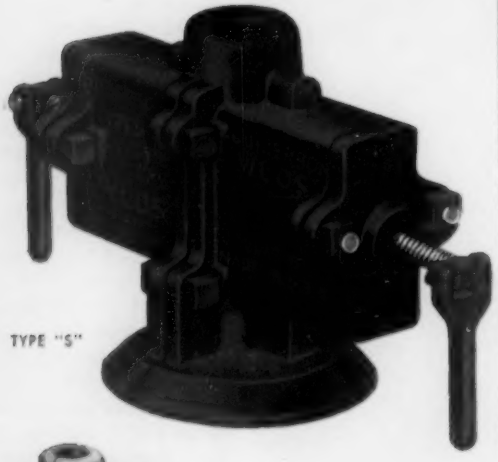
TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.

CLEAN FLOOR SAFE DERRICK



TYPE "R"



TYPE "S"

TYPE "D"

TYPE "B" RELEASING ATTACHMENT

GUIBERSON *Wire Line Oil Savers*

for Excellent Pack-Off—Clean, Dry Line

3 to choose from—take your choice and know that if it's Guiberson, it's *good!*

TYPE "R"—for tubing. Simple, inexpensive, effective. Split housing for easy installation.

TYPE "S"—for casing or tubing. Economical, simple—similar to "R" but heavier construction, flange bottom or tubing connection.

TYPE "D"—for tubing or casing. Two independent sets of rubbers, single end operation, make it cost more but still very economical. Pin or flange adapter connection.

Non-sparking brass bushings and guides throughout . . . long-wearing rubbers . . . finest Guiberson precision construction.

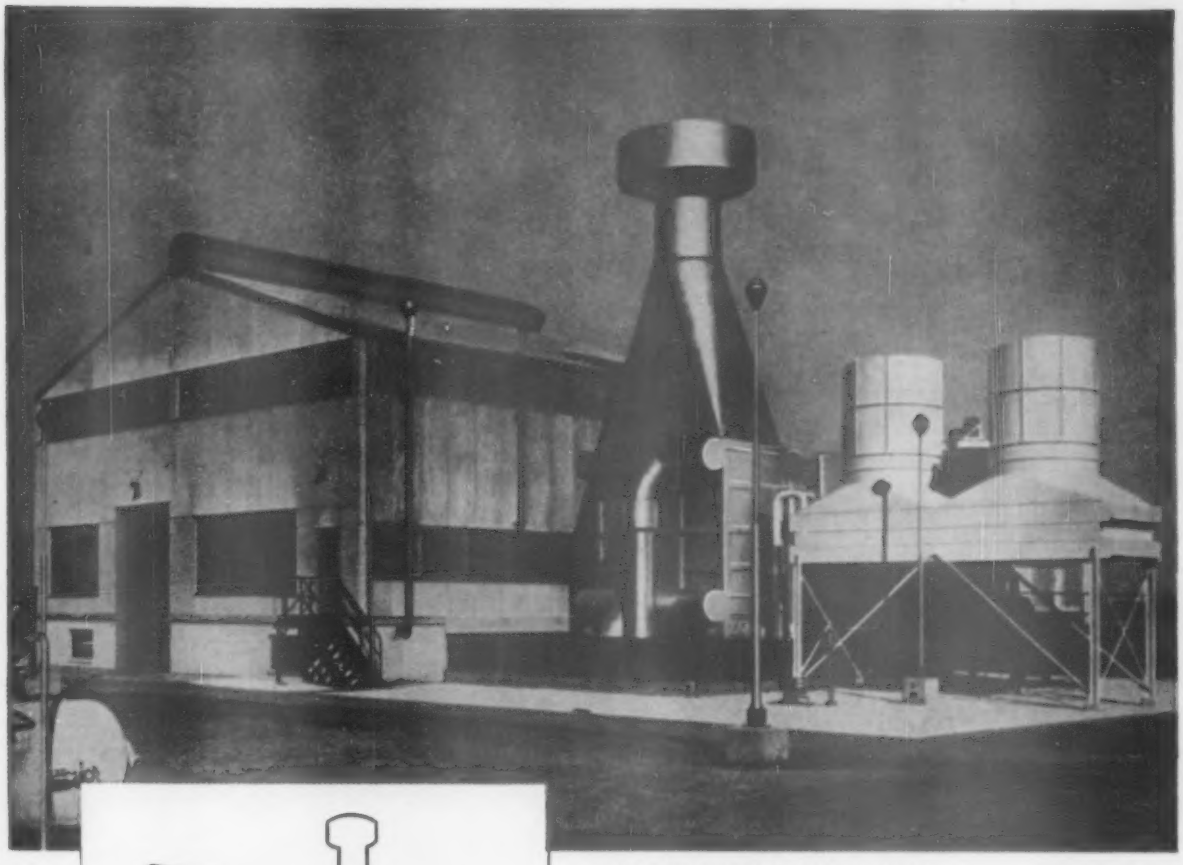
TYPE "B" RELEASING ATTACHMENT—
Positive release for Oil Savers—prevents tool damage.
Easy to attach, pressure won't release it.

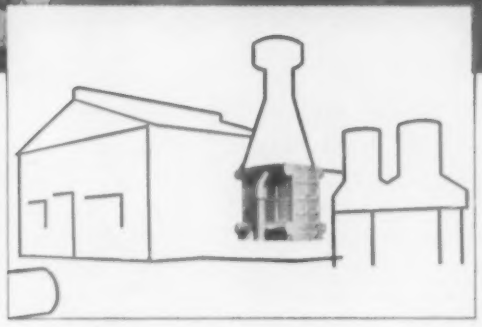
Better Be Safe Than Sorry!

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere





This is the Trunkline Gas Company's Edna Compressor Station with a Pin-Fin installed. Note the compactness of this regenerator.

* Specially designed "pin-like" shapes, which project inside the heat transfer core, give the new Air Preheater Pin-Fin its name. Their unique, patented design greatly extends heat-transfer surface area.

New Pin-Fin users are:

Tennessee Gas Transmission Co.	1 unit
Trunkline Gas Co.	3 units
Texas Eastern Transmission Corp.	6 units

NOW...economy in gas-turbine cycles with Air Preheater's new Pin-Fin* Regenerator

To compete commercially with Diesel engine steam-turbine and gas-engine cycles, a gas turbine must normally include a heat exchanger. And the most efficient unit for this service is Air Preheater's Pin-Fin—the new, extended-surface heat exchanger.

For example, a 75%-effectiveness Pin-Fin Regenerator in a gas-turbine cycle at 6-to-1 pressure ratio and a turbine inlet of 1500°F. will reduce fuel consumption by approximately 32%.

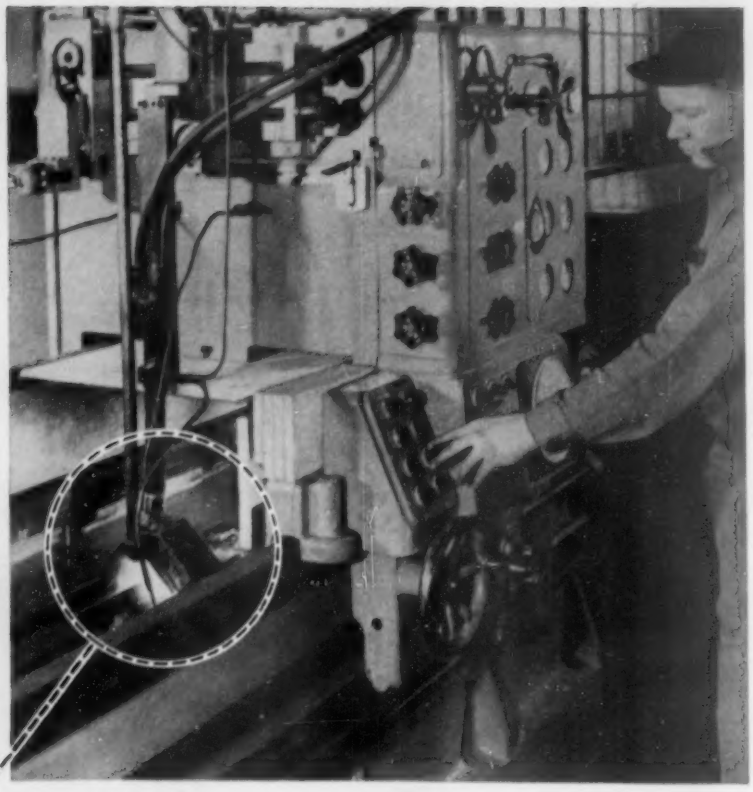
Air Preheater Pin-Fin Regenerators have been in service up to five years with no major maintenance problems. For details, call or write the Air Preheater Corporation.

MECHANICAL ADVANTAGES OF THE PIN-FIN

- Compact
- Lightweight
- Quickly erected
- Minimum maintenance
- Convenient, one-unit design
- Readily disassembled

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

HIGH SPEED FLAME-HARDENING



Cross-section view shows uniform depth of hardened surface.

SPECIAL MACHINE UPS LIFE OF GRAPHITIC STEEL PARTS

LINDE engineers have assisted Cincinnati Steel Treating Company in developing a flame hardening machine which increases service life of 16 ft. long, graphitic carbon steel lathe ways . . . Development of this automatic, high speed machine is another example of how LINDE Service Engineers are helping LINDE's customers up production speed and unit quality through co-operative research engineering.

With this new machine, a lathe way to be treated is placed on a magnetic chuck in a water filled channel. Flame-hardening heads and control mechanism move at predetermined speeds along the part. After it cools, the lathe way is placed in a refrigerator for 24 hours which stabilizes the steel, and brings its case hardness to a minimum of 60 Rockwell "C" scale.

The benefits of LINDE's research, engineering, and over 40 years of accumulated know-how stand behind each of its customers to help them solve production problems. Get these "plus-values" which LINDE offers—it pays you to do business with LINDE.

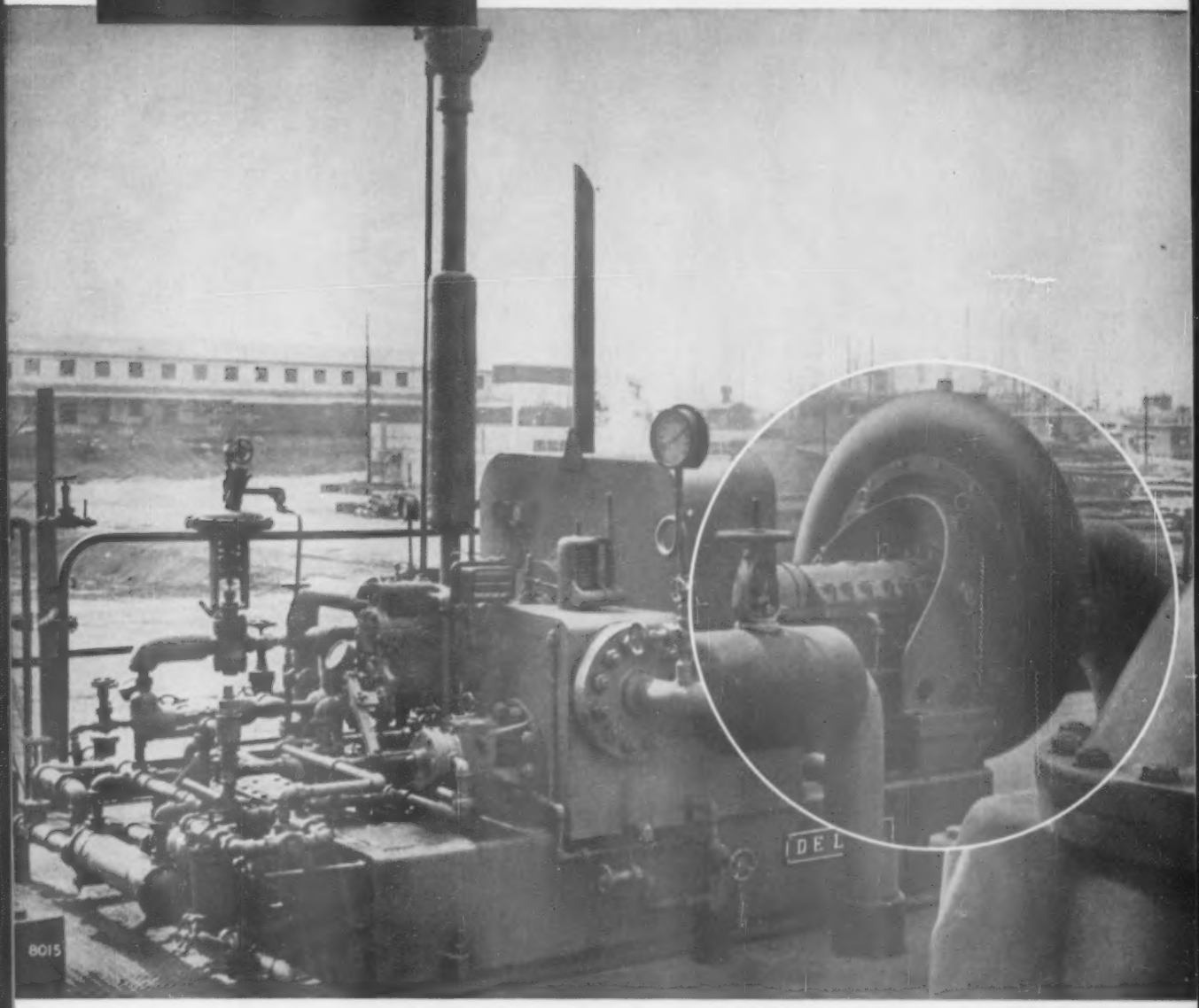
Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Linde Trade-Mark

DE LAVAL
CENTRIFUGAL
BLOWER

controls air in cat cracker at Standard Oil of California



This De Laval centrifugal blower, selected by the Fluor Corporation, is on stream at the Standard Oil Company of California's new cat cracker in El Segundo. For control air service, this blower delivers 9,500 cfm; inlet pressure is 15.4 psig and discharge pressure 19.4 psig. The blower is driven by a De Laval 220 brake horsepower MCP Turbine operating at 800 psig with a temperature of 650 F; it has all labyrinth shaft packing for high back pressure service.

In addition to single stage designs, De Laval makes a complete line of equipment for all refinery services, including multi-stage compressors driven by De Laval multi-stage turbines for condensing, non-condensing and automatic extraction applications.

Send for new Bulletin 0504

DE LAVAL *Centrifugal Blowers*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL 988

STRONGER and SAFER for every high pressure pipeline duty...

...because they are drop forged by Vogt

Send for Catalog F-9

Constantly imitated but never duplicated, Vogt drop forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-9 for our complete line of fittings and flanges.

For a copy of Vogt Catalog F-9 address Dept 24A-FO.

HENRY VOGT MACHINE CO., P.O. BOX 1918, LOUISVILLE 1, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Philadelphia, St. Louis, Charleston, W. Va., Cincinnati, San Francisco

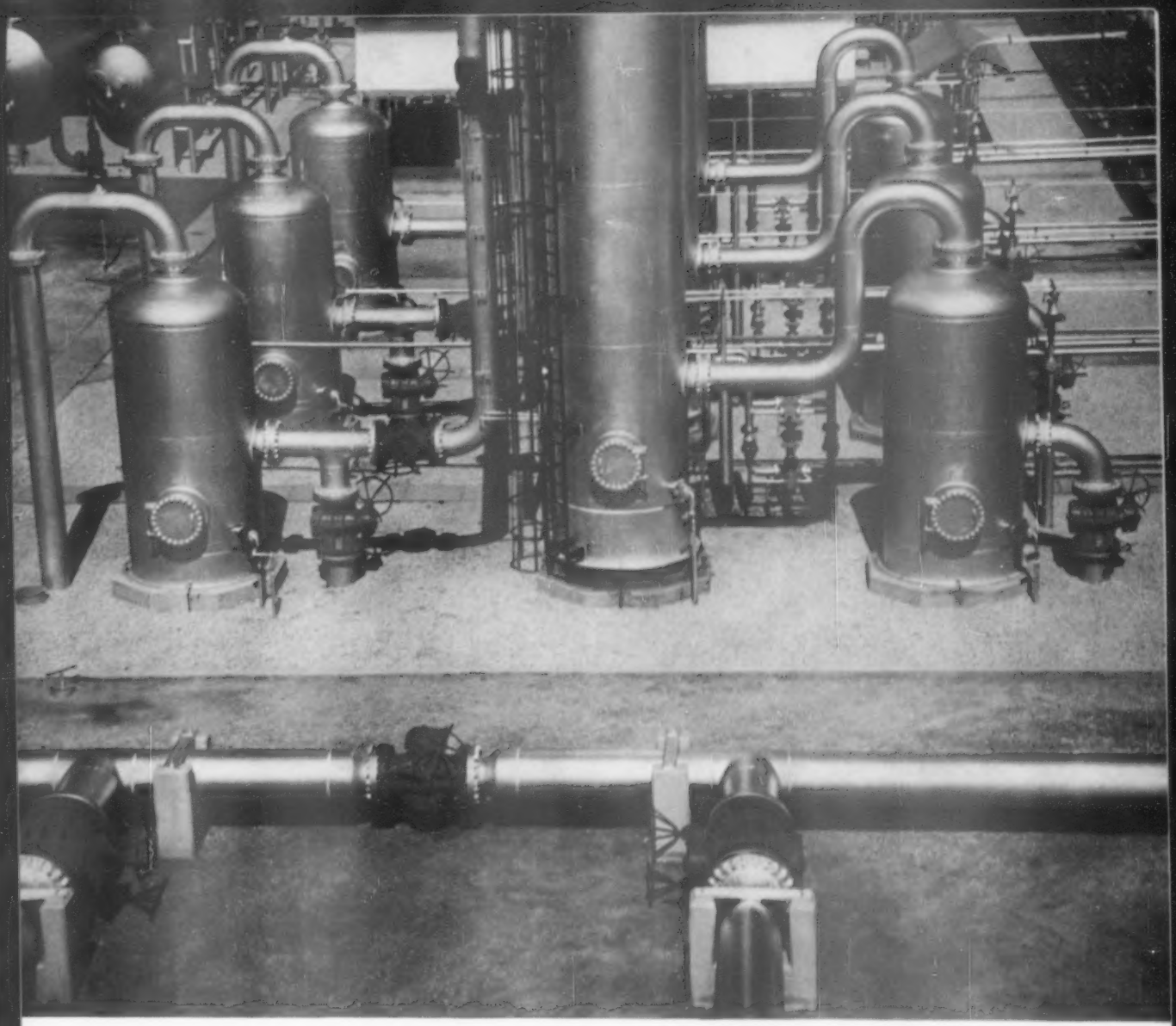
OTHER VOGT PRODUCTS

Drop Forged Steel Valves — Petroleum Refinery and Chemical Plant Equipment — Steam Generators — Heat Exchangers — Ice Making and Refrigerating Equipment.

Vogt

DROP FORGED STEEL

Fittings and Flanges



How much does safety cost?

You don't pay extra for the inherent safety of Rockwell-Nordstrom valves. Actually, their price is often lower than ordinary valves. Their cost to use, year after year, is much lower because lubricant stops trouble before it starts.

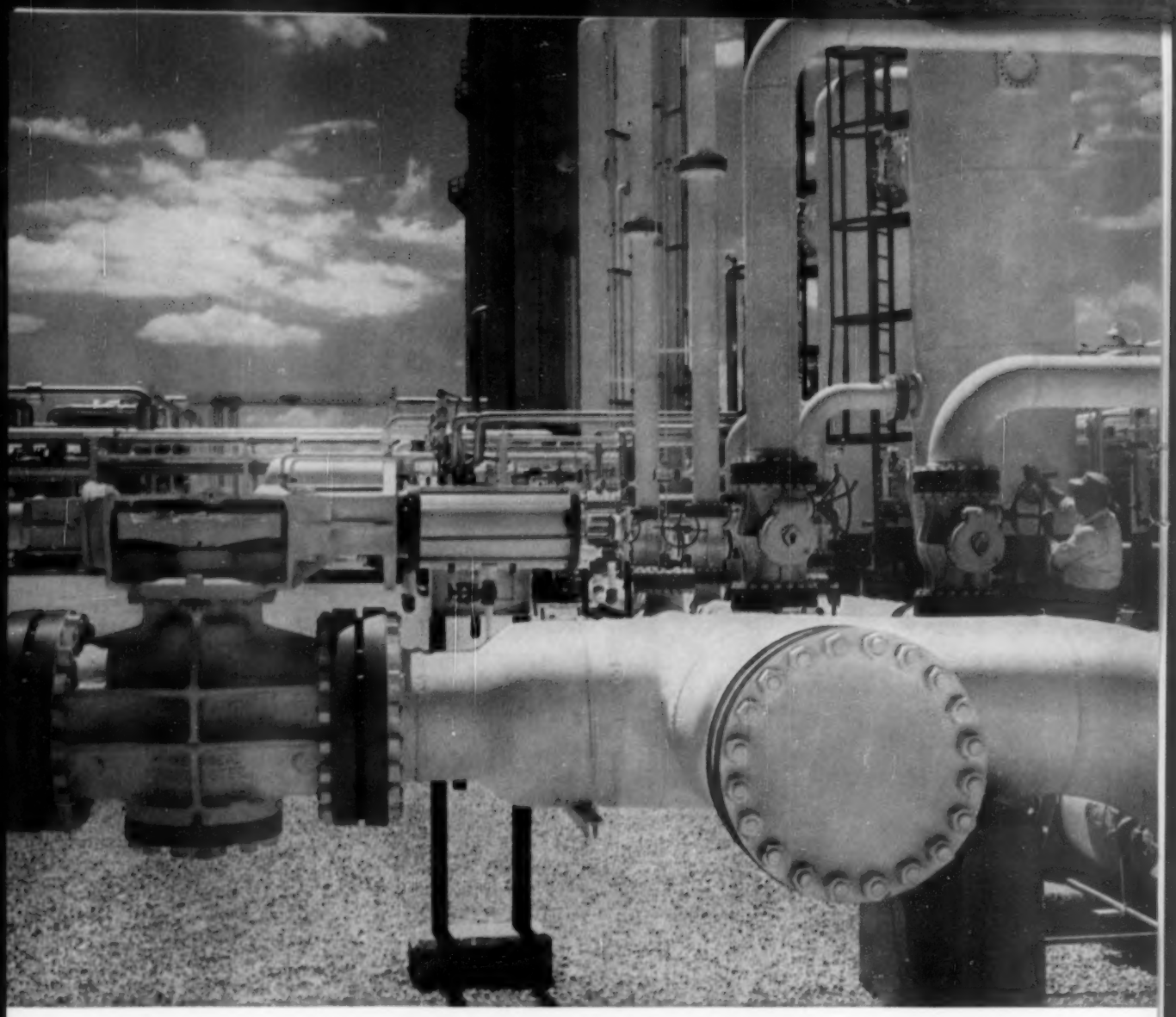
Forty years of outstanding performance have proven you can't buy a safer valve than Rockwell-Nordstrom. Pressurized lubricant sealing means positive, leakproof control on lightest gases. Streamlined thru-port design minimizes pressure loss on even heavy slurries. Quarter-turn operation is two to five times faster than ordinary valves. You *know* you are safe when you specify Rockwell-Nordstrom valves. Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.

Available at leading suppliers . . . everywhere.

ROCKWELL-Nordstrom VALVES

Lubricant Sealed for Positive Shut-off

40th Year *of lubricated plug valve leadership*



For power operation . . . clearly superior

Rockwell-Nordstrom valves' quarter-turn operation allows the use of less complicated (and less costly) operators. Lubrication greatly reduces torque. The thin, tough film of *pressurized* lubricant that forms the leakproof seal also cuts maintenance and down time by stopping trouble before it starts.

For electric, pneumatic or cylinder operation, Rockwell-Nordstrom valves perform better, longer, for less money. For more information, write: Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.

Available at leading suppliers . . . everywhere.

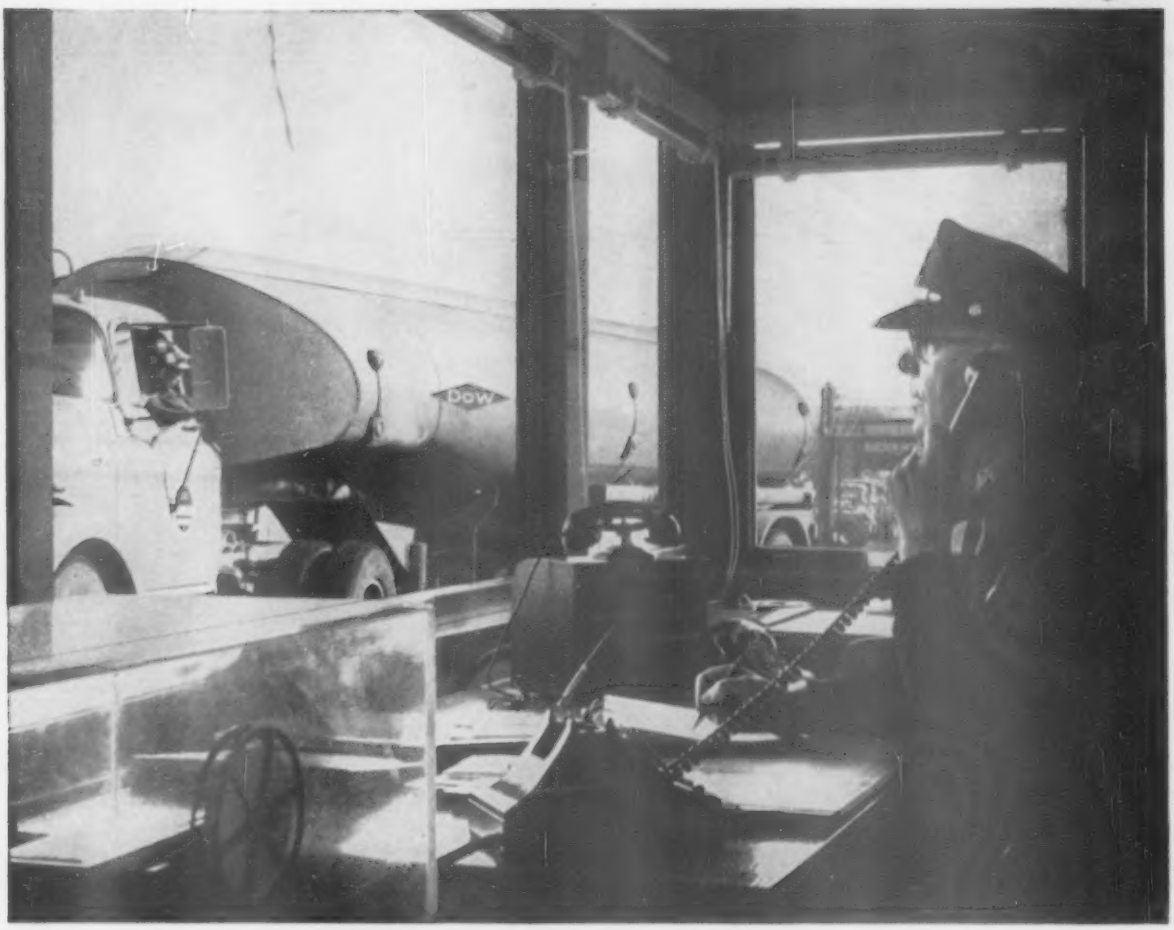
ROCKWELL-Nordstrom VALVES

Lubricant Sealed for Positive Shut-off

40th Year *of lubricated plug valve leadership*

KINNEY

DOW



right on schedule–as usual

No delays—no disappointments! You can depend on Dow glycols and amines to arrive when you need them

Nobody needs to tell you that a lot of things depend on prompt delivery—important things like maintaining your production schedule, getting full use of manpower, keeping costs in line. But nobody has to tell you . . . so all we'll say is this:

Dow shipments will arrive on time—when you need them. You can depend on it.

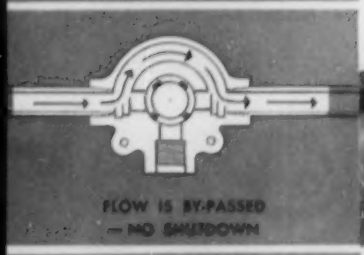
Whether you need *Diethylene Glycol* or *Triethylene Glycol* for dehydrating or *Monoethanolamine* and *Diethanolamine* for sweetening natural gas, you can rely on Dow. For service, availability and prompt delivery contact your nearest Dow sales office or THE DOW CHEMICAL COMPANY, Midland, Michigan, Department OC 847E-3.

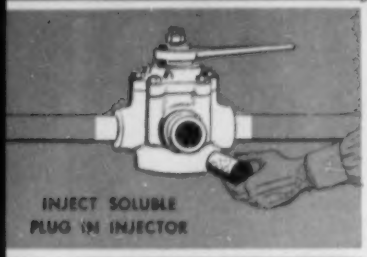
DOW GLYCOLS AND AMINES

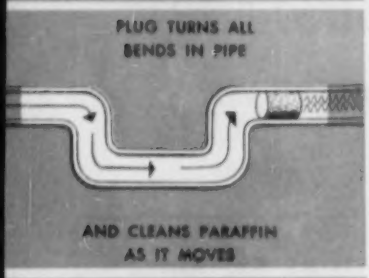
Ethylene Glycol
Diethylene Glycol
Triethylene Glycol
Monoethanolamine
Diethanolamine
Triethanolamine

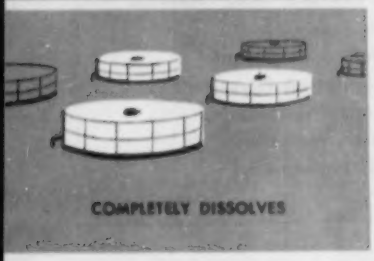
you can depend on DOW CHEMICALS DOW

KINNEY PLUG INJECTOR









Removes Paraffin Without Shutting Down the Well . . .

KEEPS FLOW LINES OPEN

Hundreds of wells have already been equipped with Kinney Plug Injector on the flow lines. Made in sizes from 1″ to 4″ for low pressure and high pressure, the Kinney Plug Injector receives the soluble-mechanical plug by a simple turn of the handle which causes the flow to by-pass (see diagram to the left).

When plug is inserted and the handle turned in regular operating position, the plug is forced through the paraffin zone. The wax dislodged from the walls of the pipe by the moving plug is then carried out with the production oil. No shut-down time necessary, as a 1″ by-pass allows for equalized pressure to avoid damaging the plug.

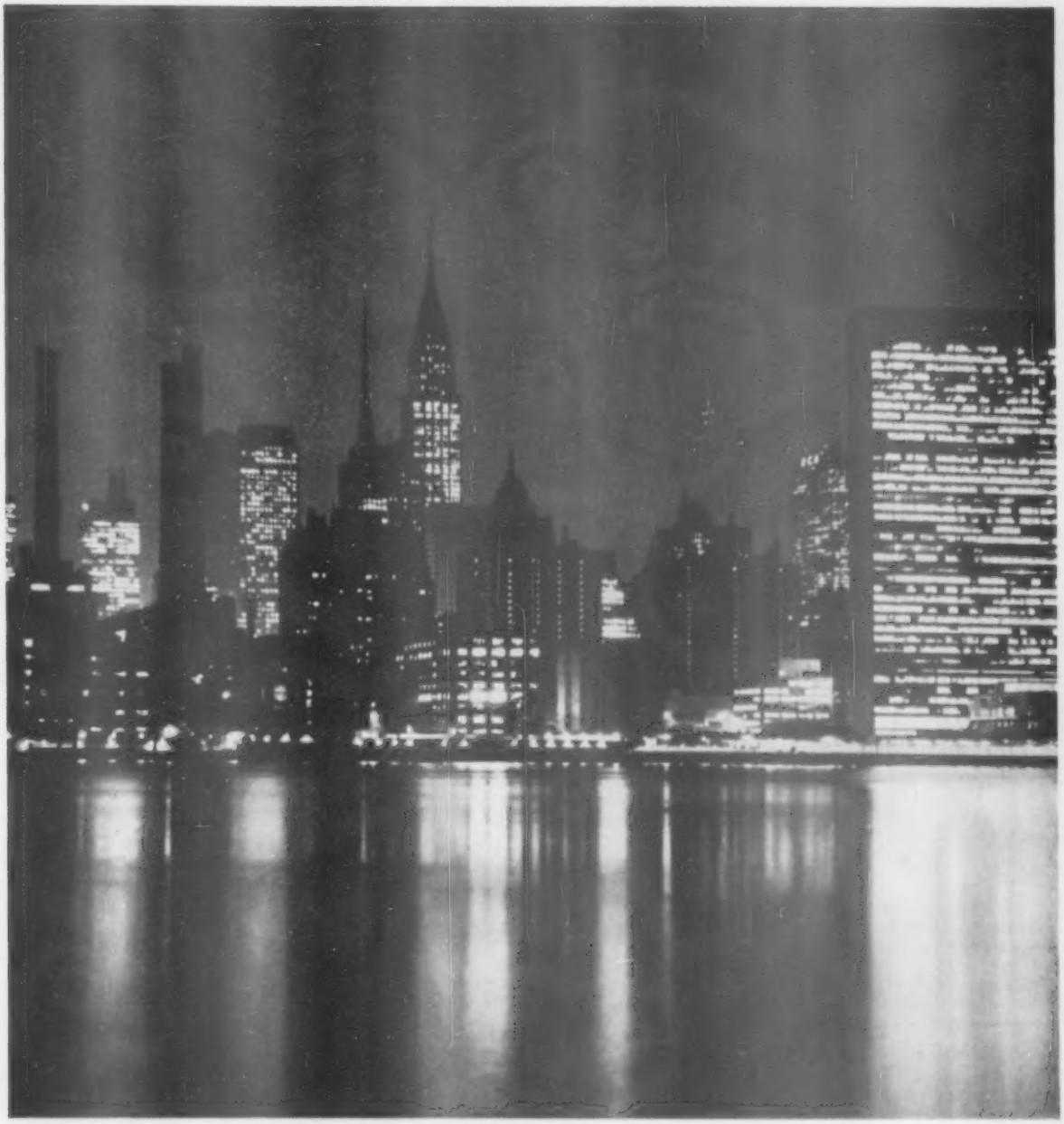
The soluble-mechanical plug disintegrates within a few hours after injection, and need not be retrieved. The plug is designed to hold its hardness long enough to do the job and, at the same time, make all the necessary turns in the pipe in order to reach the destination. ***Oil Tool Sales Office—1404 Dunlavy—Houston 19, Texas; Oil Tool Warehouses in Beaumont and Odessa.***

ALCO

ALCO PRODUCTS, INC.

New York

Sales Offices in Principal Cities



"The long-range energy requirements of the United States and the world are so great that no one form of energy, as we know our energy resources today, can hope to meet more than a fraction of these requirements. There is room and need for all forms of energy, and we see nothing ahead in the oil business but a demand for more and more oil."

A statement by M. J. Rathbone, President, Standard Oil Company (New Jersey)

ESSO

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

If You Want Industrial Tools with "Guts," See Your PROTO Distributor

Your Distributor Has a Complete Selection of PROTO Heavy-Duty Industrial Wrenches

From the big PROTO line you can choose the extra-strong industrial wrenches you need for almost any job. All are forged from special alloy steels for strength, and have superior design features that make them your best buy!

PROTO's complete line of *professional-quality* power and impact sockets are built to withstand industry's *roughest punishment.* Special alloy steels and superior design give you great strength and toughness.

Whether you need midgets or giants, your Industrial Distributor has the right PROTO power or impact socket you need. Buy them from him. Send for catalog of entire line to

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Los Angeles 54, Calif.

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PROTO TOOLS

Eastern Factory, Jamestown, N.Y. • Canadian Factory, London, Ont.

They Say—

Iran Shows Know-It-Alls

Dear Sir:

On a recent major discovery in the interior basin of Iran . . . This discovery is evidence to me of another characteristic of our industry. We think we know all about the occurence of oil in the earth's crust today. Many of us think that we have already found all the big oil fields in the world and that oil finding is on the downgrade. Yet here is a major field of tremendous proportions that has been kicking around the front offices of all the big oil companies for 30 years. None of us was able to recognize its potentialities.

Further evidence of the same fact is embodied in the record of the discovery of the greatest oil field in the world, Kuwait. We all recognize it today for what it is, the greatest oil field in the world, yet it is barely 20 years since it was discovered and up to the very date of its discovery it also was kicking around the front offices of all the principal oil companies of the world. Yet the international oil industry had known Kuwait and its giant seepages for a full half century before anybody thought it worthwhile to drill that prospect.

Wallace E. Pratt
Carlsbad, N. M.

Land of the Unused Pump Jack

Dear Sir:

Recent articles in The Oil and Gas Journal about the big gusher in Iran remind me of an Iranian friend of mine who visited us in Wyoming a short time back. He was educated in Colorado and is at the present time working in a geological capacity for the Texas Gulf Sulphur Co. in Houston.

His name, Morad Malek-Aslani, is practically a story in itself. He told me that Malek means "King" in Turkish and Aslani means "Lion" in Arabic, so we were quite proud to have had the opportunity of showing some of that wonderful Wyoming geology to the "King of the Lions" from fabled Persia.

The old familiar pump jack seems commonplace to most of us in the business but I never realized how possibly insignificant they might be until "Mo" went on a field trip with us into the Big Horn basin.

To get a look at some of the exposed structures there we had to pass

PROTECT TOOL JOINT THREADS *with*

MEETS DEMANDS

of faster, deeper drilling!

MONEY BACK GUARANTEE!

Sold through your favorite supply store

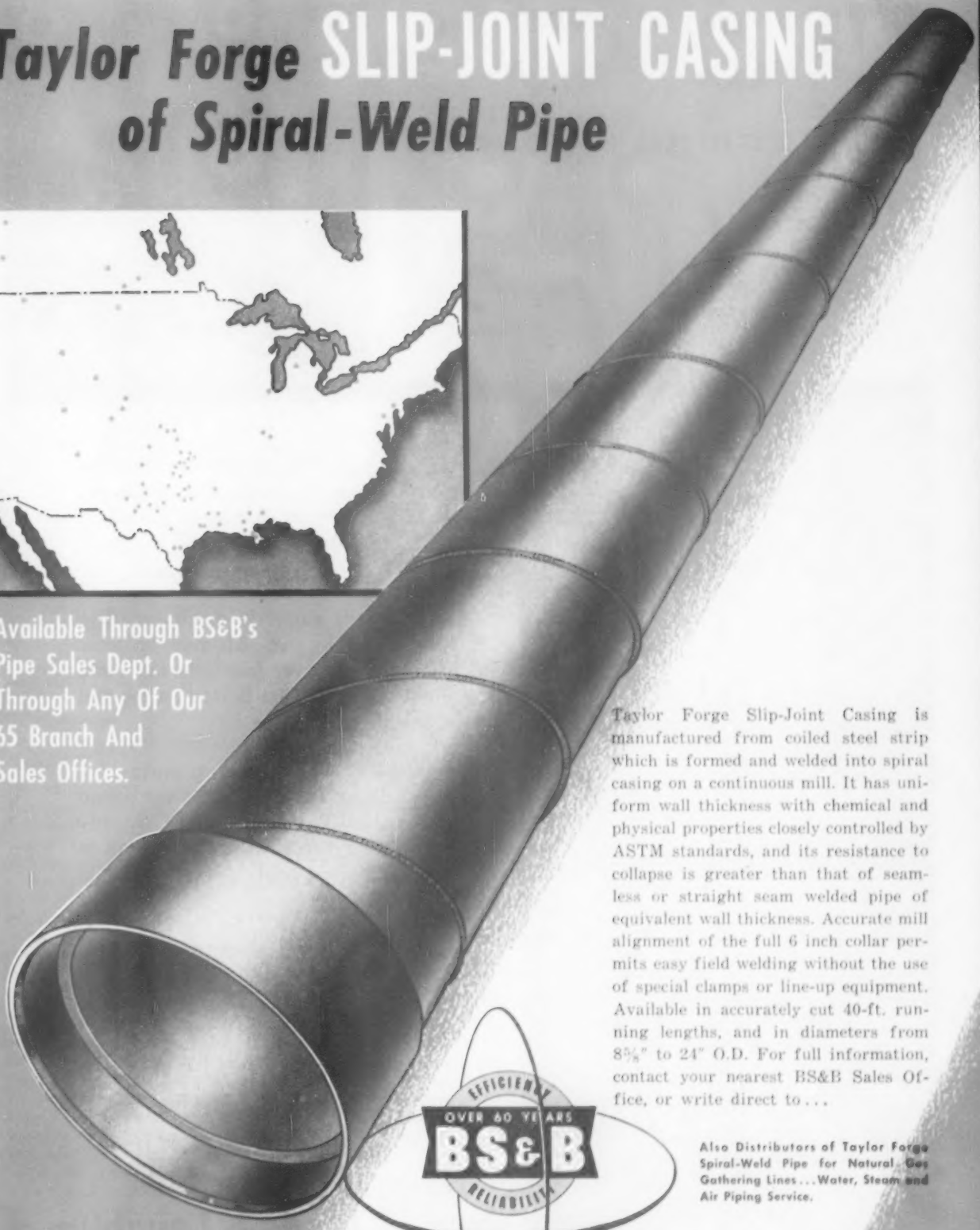
USE JIMMY GRAY DOPE BRUSHES

PETROLEUM DISTRIBUTING COMPANY

BOX 203 - HOUSTON, TEXAS - CApitol 4-9648

Taylor Forge SLIP-JOINT CASING of Spiral-Weld Pipe

Available Through BS&B's Pipe Sales Dept. Or Through Any Of Our 65 Branch And Sales Offices.



Taylor Forge Slip-Joint Casing is manufactured from coiled steel strip which is formed and welded into spiral casing on a continuous mill. It has uniform wall thickness with chemical and physical properties closely controlled by ASTM standards, and its resistance to collapse is greater than that of seamless or straight seam welded pipe of equivalent wall thickness. Accurate mill alignment of the full 6 inch collar permits easy field welding without the use of special clamps or line-up equipment. Available in accurately cut 40-ft. running lengths, and in diameters from 8⅝" to 24" O.D. For full information, contact your nearest BS&B Sales Office, or write direct to...

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY

Also Distributors of Taylor Forge Spiral-Weld Pipe for Natural Gas Gathering Lines...Water, Steam and Air Piping Service.

BLACK, SIVALLS & BRYSON, INC.

Pipe Sales Dept. 1-A12

P. O. Box 1714 Oklahoma City, Okla.

SUPPLY *can give your oil a real*

LIFT!

J&L Supply men from the Gulf of Mexico into Canada and from the Rocky Mountains east keep a vigilant eye on producing wells. This has been going on for over fifty years.

Cabot units expertly engineered to fit your wells put J&L men on your team. They never lose interest. Field service shops in the United States and Canada never close.

For the best in pumping units—for immediate service—for seasoned advice, call your local J&L Supply store today! You will find it listed in the yellow pages of your phone book.

CABOT ADJUSTABLE-CRANK Series structure capacities are from 7,000 to 32,000 pounds maximum polish rod load. The flood lubricated Sykes-cut herringbone gears are rated (API) from 40,000 to 456,000 inch-pounds. ILLUSTRATED HERE: Upper right, AC15-114D, polish rod 15,000; peak torque 114,000. Upper left, AC13-114D, polish rod 13,000; peak torque 114,000. Lower left, AC9-40D, polish rod 9,000; peak torque 40,000.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

12M

through some of the famous oil fields of that region. Most of the wells had pump jacks on them and after passing three or four of these fields east of Thermopolis, this Iranian geologist made a mild comment that gave me a better understanding of the oil potential of the Middle East, and also tempered my boasting about the crude oil possibilities of Wyoming.

He said, "In my country, when a well quits flowing and has to go on the pump, we plug it."

S. B. Frazier
Charleston, W. Va.

Trans-Canada Financing Assured

"Recent substantial increases in gas sales contracts in Canadian markets have materially enhanced the economic factors of the (Trans-Canada) project . . .

"Financing can go forward regardless of whether or not the U. S. Federal Power Commission rules favorably on the proposals of Tennessee Gas Transmission Co. and its affiliate, Midwestern Gas Transmission Co., to import up to 200,000,000 cu. ft. daily of gas at the international boundary terminus of the lateral line from Winnipeg and export up to 90,000,000 cu. ft. of gas daily into Canada at the international boundary near Niagara Falls."

C. W. Murchison, president, Canadian Delhi Petroleum, Ltd., in a recent statement to shareholders.

Key to Government Relations

"The best way to keep the role of Government to a reasonable minimum is to keep our business system successful—to avoid the kind of business conditions and practices that inevitably give rise to governmental intervention."

Roy Blough, professor of international business, Columbia University, in a speech before the American Petroleum Industries Committee, at American Petroleum Institute annual meeting.

A Modern Emulsion

"In today's world, oil and politics never can be kept completely separate, like oil and water. Modern events have created an emulsion. This we cannot change. All we can do is accept the situation and strive to make the necessary relationship a healthy one for both sides. We must accept the fact that, whatever our own wishes may be, several factors insure that the relationship itself will continue.

"All nations recognize that oil is a weapon of war as well as fuel for the engines of peace . . . The Suez crisis offered another forceful reminder of a fact every informed person already

Like the modern automobile with its power surge, every Weco Union has an extra measure of strength to take extraordinary service.

The best example of this is the use of Weco Unions in service company operations. Under high pressures and volumes, under shock, surge and vibration, Weco's ball and cone seat holds a seal that refuses to leak. The strong Acme threads in the female sub and wing nut make-up easily—break-out quickly—time and time again without damage or distortion. The tough wing nuts, sturdier sub ends with heavier wall construction, withstand the toughest treatment—on job after job—and come back for more.

This extra service from extra strength makes Weco the best union buy in the oil country today. Get them at supply stores everywhere.

U-12-56

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO®

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

Behaves well in your Processes

JEFFERSON gas scrubbing agents

monoethanolamine, diethanolamine — for sweetening natural and refinery gas

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knew: Oil is a king on the chessboard of world politics.

"Consequently, where the defense and foreign policies of our nation are concerned, this industry cannot stand apart from Government. It must work closely with Government for the nation's welfare and security."

Frank M. Porter, president, American Petroleum Institute, in a speech before the A.P.I. general session.

Cold Eye Focuses on Oil

"The Attorney General of the United States, in his recent report on the Interstate Oil Compact Commission, stresses the fact that the report 'calls for an inquiry into the practices and organization of the oil production industry.'

"... That means that the Department of Justice plans to turn its cold eye on the Compact, the oil companies, on the state regulatory groups.

"If we are to maintain the political integrity of our states, we must all pitch into this battle for survival. Otherwise we'll have to sit back and observe while the federal Government steps in and takes a little bit here, a little bit there, until the states actually become little more than geographical units, impotent and weak—little puppet functionaries controlled by Washington's master hand.

"Our Oil Conservation Commission, which we consider a pretty competent and efficient agency, isn't going to be a sitting duck for federal sharpshooters. If the Department of Justice plans to 'pioneer in the supervision of state regulatory bodies,' I would suggest that they plan to pioneer somewhere else—they're not going to do it in New Mexico."

John F. Simms, Governor of New Mexico and chairman of the Interstate Oil Compact Commission, in a speech before the American Petroleum Institute Division of Production group session.

The Right Word for It

"Sometimes those of us in official positions are inclined to think your industry has a mistaken idea in conservation. We sometimes think the oil and gas people believe the word is 'conversation' instead of 'conservation.' "

Gov. Edwin C. Johnson of Colorado, in a speech at the annual meeting of the Rocky Mountain Oil and Gas Association in Denver.

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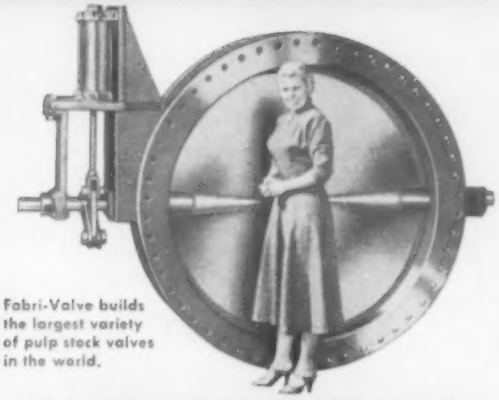

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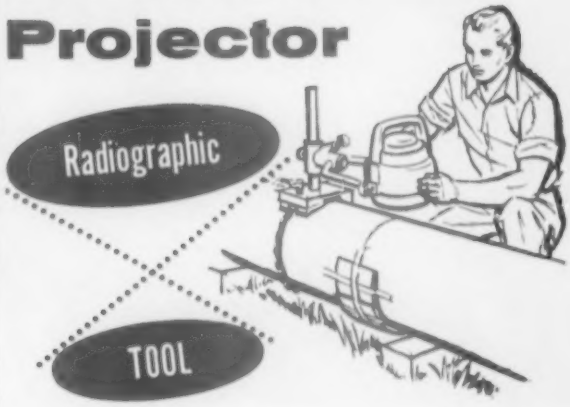

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Take a straight-sided belt (Fig. 2) and bend it. Feel the sides at the bend; they bulge out. Now picture this bulge in the sheave groove (Fig. 2-A). It is easy to see that the belt makes uneven contact at points indicated by arrows. Naturally, wear is greater at these points. Uneven wear shortens belt life; increases belt costs.

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TPA 59

Gates VULCO ROPE Drives

ness in the U. S. Not only are you our best customers, but we are by far your best customer."

S. A. Swensrud, chairman of the board, Gulf Oil Corp., in a speech before the Empire Club of Canada, Inc., Toronto.

Middle East Oil's Value

"Some time back the venerable Winston Churchill hit the nail pretty directly with the comment that in all probability Middle East oil would be neutralized in event of war. Certain it is, of course, that whatever world powers had access to these resources at war's beginning, retaliatory raids by enemy nations likely will destroy its value as an implement of war.

"Oil, thus, is an important and intriguing Middle East bone of contention, but only for its value to its proprietors during times of world wide peace. In time of war it likely would be of no value to any nation."

Editorial in the Tulsa World.

CALENDAR OF EVENTS

DECEMBER

5-6 The Asphalt Institute, annual meeting.

6-8 American Petroleum Institute, Oil Industry Information Committee meeting, Biltmore Hotel, New York.

6-8 Interstate Oil Compact Commission, annual meeting, Fontainebleau Hotel, Miami Beach, Fla.

9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

11-12 Water Quality Control for Subsurface Injection, conference sponsored by the University of Oklahoma, Norman, Okla.

1957

JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

14-18 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

21-25 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

23-24 Northwest Petroleum Association, Nicollet Hotel, Minneapolis.

23-25 Instrumentation for the Process Industries, sponsored by Texas A. & M. College, chemical engineering department, College Station, Tex.

31-Feb. 1 Annual instrument short course of Southern California Meter Association, Los Angeles Harbor Junior College, Wilmington, Calif.

FEBRUARY

8-9 American Society for Testing Materials, Symposium on composition of petroleum, Jung Hotel, New Orleans.

13-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

15-16 National Society of Professional Engi-

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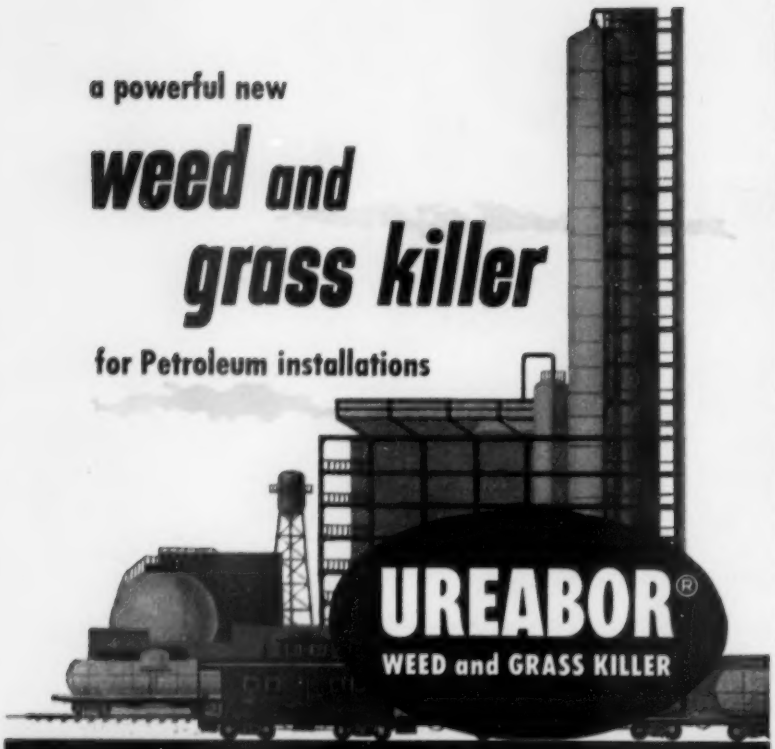

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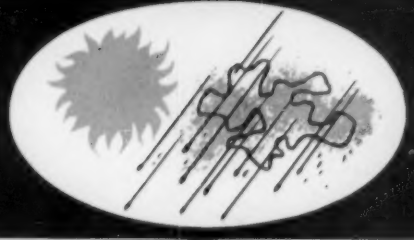

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neers, spring meeting, Hotel Francis Marion, Charleston, S. C.

17-18 Engineers, Joint Council, Statler Hotel, New York.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.

MARCH

3-6 American Institute of Chemical Engineers, regional meeting, the Greenbrier, White Sulphur Springs, W. Va.

6-8 American Petroleum Institute, Southwestern district production division meeting, Statler-Hilton Hotel, Dallas.

8 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

11-15 American Institute of Chemical Engineers, regional meeting, Philadelphia.

11-15 National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

12-13 Subsurface Geology Symposium, fifth annual conference, sponsored by the University of Oklahoma, Norman, Okla.

20-22 American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La.

25-27 Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.

27-29 American Power Conference, Sherman Hotel, Chicago.

APRIL

1-4 American Association of Petroleum Geologists, national convention, Kiel Auditorium, St. Louis.

2-4 Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.

7-10 Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.

7-12 American Chemical Society, national meeting, Miami, Fla.

10-12 American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.

11-13 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest Regional Conference, Portland, Ore.

14-17 Texas Independent Producers and Royalty Owners Association, Galves and Buccaneer Hotel, Galveston, Tex.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.

24-26 National Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

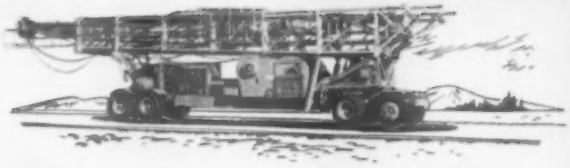
24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

29-May 1 Southern Gas Association, annual convention, New Orleans.

OVER THE ROAD



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Torqmatic Handles Two Tasks in Franks Clipper Rigs

(in slim hole drilling, it's Torqmatic all the way)

One transmission for two jobs—that's the story of Allison TORQMATIC DRIVES in Franks Clipper rigs. These Clippers handle slim hole drilling, servicing and workover jobs with a speed that'll make you whistle—and a low cost that'll make you grin.

Over the road, the Allison TORQMATIC DRIVE transmits engine power to the driving axles of this completely self-contained rig. It drives as easy as any highway truck—far easier than most—because there's no clutch pedal to push, no gearshift guesswork. The speedy Clipper's clip on the highway and off means more time for the job—less time *between jobs;* means operators get more use out of their rigs and a greater return on their investment.

Over the hole, the Allison TORQMATIC DRIVE speeds operations and cuts costs, too. Drillers make faster round trips because they can bring a string off bottom in low gear, then quick-shift to high at full throttle for quicker pipe pulling. And the TORQMATIC Converter extends equipment life because it cushions shock loads instead of transmitting them to the drive-line and other rig components.

The number of oil men who swear by Allison TORQMATIC DRIVES is legion. They've seen the low-cost performance records rung up through the years by these torque converter-transmission teams. If you'd build or buy better equipment, specify Allison TORQMATIC DRIVES. More information? Write Allison Division of General Motors, Box 894R, Indianapolis 6, Indiana.

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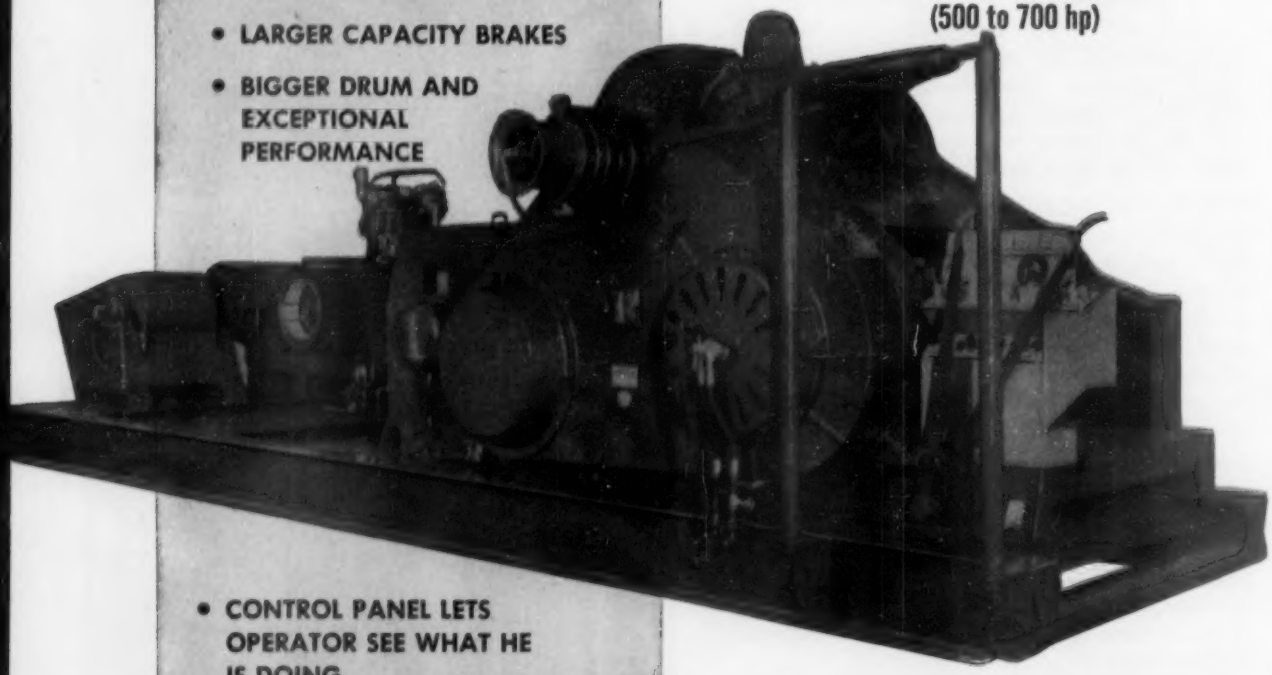

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

Color Stories

BEING a "yellow journal" in no respect other than the color of its cover, the Big Yellow Book never colors its articles. But to put a little color into your reading matter, this department presents three anecdotes about color and the oil industry.

1. Colored Plants

A feminine arrival at the Philadelphia International Airport rushed up to an attendant and asked, "What's that huge garden I saw over there just before we landed?" He thought she was wacky until he figured out that what she had seen was Gulf Oil Corp.'s big refinery.

How could a refinery be mistaken for a garden? Because Gulf is giving the place a paint job. And what a paint job! The 700 tanks, buildings, and processing units are beginning to look like Disneyland, glowing with soft pastel shades. But so it wouldn't look like an explosion in a paint factory, Gulf hired an exterior decorator to work out a careful color scheme for a harmonious blend of eye-pleasing tints. Already it's won Gulf a civic award for the refinery beautiful.

Gulf is by no means the only company going in for "Operation Rainbow" in its refineries. We've heard of a lot of them blossoming out in dusty rose, forest green, desert yellow, and every tone in the decorators' spectrum. It seems to be a manifestation of the oil industry's "new look" in public, employe, and community relations.

But we heard of one plant which, in our opinion, is going at it wrong from the standpoint of employe relations. This plant is letting the employes choose the colors. We once served on the house committee of a club which was being redecorated, and from that experience we predict that this company will get into the dangedest wrangle ever. Everybody thinks he's an expert on color, but no two tastes agree. Wives will get into the act, families will be torn asunder, and workers will feud over whether the cat cracker should be lilac or chartreuse. Better the plant should stay black.

2. Colored Plant

A gentleman of color has been working a minor confidence game among oil men in Oklahoma, and he may be heading your direction by now. This fellow claims to have title to a few acres of unleased and undrilled land right in the heart of the East Texas oil field.

He has just enough evidence with him to whet the interest of any operator, large or small, who sees a chance to pick up some good locations in a proven area at a bargain price. It doesn't take him long to make his plant. But when it gets down to details, he finds he has left his abstract back home and lacks about 10 bucks of enough carfare to get back and get the papers out of the vault.

So the sucker shells out a five-spot or so to bind the deal. That, of course, is the last ever heard of the lease broker — until it is learned that he touched a dozen other oil men the same way before heading for the next town. He may or may not have title to the tract, but his method of leasing it seems to be as shady as his complexion.

3. Plant Colors

Many years ago a plant chemist discovered that he could take the color out of vegetable matter—the green out of leaf juice, for instance—by filtering through a column of adsorbent charcoal. He called the process chromatography, which is Greek for color writing. It's widely used in the food industry, such as for making brown sugar white.

The dictionary defines chromatography as separation of closely related compounds by selective adsorption whereby the separate compounds are adsorbed in separate colored or tinted layers.

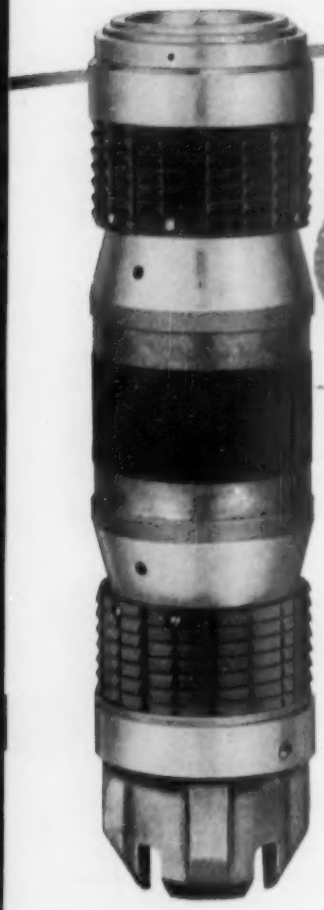
Now chromatography promises to revolutionize the refining and gas-processing industry by using selective adsorption to analyze a gas stream. Only in this use, no color whatever is involved. Nothing is left but the confusing name—which wasn't very appropriate in the first application.

So, from taking color out of plant material, the oil industry now has a new and exciting tool. That's all we know about the name. For what chromatography can do for you, read all about it in the big symposium-in-print we have scheduled on the subject for our December 17 issue.

—*Henry D. Ralph.*

How to buy a BRIDGE PLUG

Just be sure it meets these 7 requirements .



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7 IT MUST BE AVAILABLE wherever and whenever you need it. Baker Bridge Plugs are set by all leading wire line service organizations, and are quickly available through their 300 service points.

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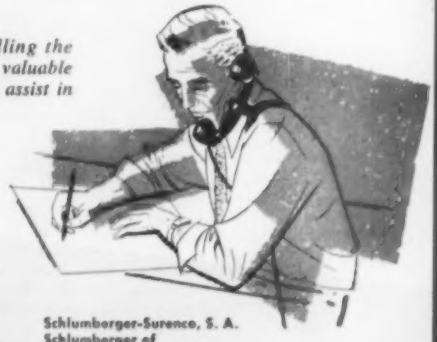

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BAKER RETAINER BRIDGE PLUG

Now's the time to fix oil's ills

THE ill wind of the Middle East is blowing some good to the American oil industry. The Suez closing is doing things for the industry that the industry should have done for itself but didn't.

The question is whether the industry will use this situation to get itself out of a hole or whether the end of the emergency will find it in an even deeper morass.

Much depends on the duration of Europe's emergency demand for oil. It could drag on for a long time—but it could begin to taper off in the near future. In any event it won't last forever, and the industry should act wisely to use the opportunity to put its house in better order.

CRUDE PRODUCTION is going up fast under the impact of European buying. But the bulk of that impact hit a limited area first, and is spreading unevenly. If other areas will restrain themselves until the demand actually reaches them they will have a chance to clean up the problems of oversupply which have plagued them so long.

Crude stocks are beginning to move down. But their national level is still very high, and in many areas tanks are too full to accommodate a premature increase in production. So here's a chance to work off the burdensome excess inventory.

Demand for heavy fuel oil has increased strongly and for distillates moderately, and prices of both are firming. But gasoline production and stocks are still excessive and its price is weak. So now's the time to shift the refinery yield pattern to correct the chronic ailment of too much motor fuel.

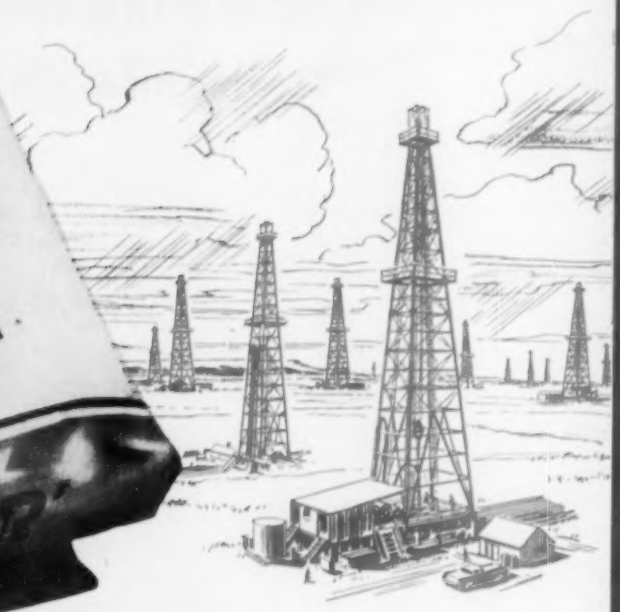
Crude-oil prices, long depressed below replacement costs, can move upward in the near future if conditions are right. Don't look for a general increase if it appears that the Suez may be opened in a couple of months.

But around the first of the year, if it then appears that the European shortage will continue until summer, better crude prices will be in order—provided production no longer exceeds actual buyers' requirements, crude stocks are down to reasonable working levels, and excess gasoline no longer prevents refiners from paying a fair price for crude.

FEDERAL PRICE CONTROL is a possibility if the situation becomes acute. So the industry should move cautiously but should get its price structure in shape for a freeze, not only in the basic crude price but also in the relationships among products prices. A key to this is what happens to inventories in the next few weeks.

Suez can bail the U. S. industry out of many of its chronic troubles provided the industry uses foresight and good judgment in tailoring its actions both to the needs of Europe and to its own peculiar situation.

THERE'S A LONE STAR CEMENT
FOR EVERY OIL-FIELD NEED



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Old-timers well remember 'INCOR' 24-Hour Cement, and with good reason. Because 'Incor' has been used with noteworthy success in cementing thousands of wells, invariably reducing the cost of "waiting on cement," saving lost rig-time, providing strong, tight, long-lasting shut-offs.

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There is a Lone Star Cement for every Oil Field requirement: 'INCOR'*, America's FIRST High-Early Sulphate-Resistant Cement . . .'STARCOR'* Slow-Setting Oil Well cement...'TEXCOR'* Deep Oil Well Cement...LONE STAR Cement, standard of highest quality for half a century.

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Select Cement to Fit the Job!

Current and significant in . . .

The Industry This Week

Pipelines

• **Two superinch lines** in the Middle East are under study. They would stretch from Kirkuk field and the Persian Gulf north through Iraq and west through Turkey to the Mediterranean. P. 66.

$120 million worth of debentures and common stock will be put on the market by Trans-Canada Pipe Lines, Ltd., to help finance the 2,250-mile gas line. P. 72.

Transcontinental Gas Pipe Line's $54 million expansion program in nine states is nearing completion in time to boost winter deliveries to the New York area. P. 63.

Exploration

• **Two more wildcats for Cuba** are on the exploration program of Consolidated Cuban Petroleum Corp. It also is stepping up production in the island's Cruz Verde field near Havana. P. 88.

Counties in Montana can't take over mineral rights for unpaid taxes assessed against such rights, state's Supreme Court has ruled. P. 70.

Kermac's much-publicized giant Rig 46 is passing its shakedown drilling job with flying colors. P. 64.

Processing

• **Petroleum aromatics** may be near a major breakthrough in the chemical field. It will come about through a totally new approach in liquid-phase oxidation. P. 62.

Reactivation of oil-shale research plant at Rifle, Colo., will more than likely be put before Congress next session. P. 82.

Lion's share of oil industry's research bill of $161 million last year went to refining and manufacturing projects, latest report shows. P. 65.

Octanes are inching up again. Premium gasoline now averages 97.3 and regular 90.3, Ethyl survey reveals. P. 64.

New refinery on the East Coast is being planned by Gulf Oil Corp. A 3,000-acre site has been optioned near Charleston, S. C. P. 70.

Production

• **Louisiana production will reach** 973,471 bbl. daily in December due to another 100,000 bbl. daily boost in state's allowable last week. Oklahoma production also is sure to start upward again. P. 68.

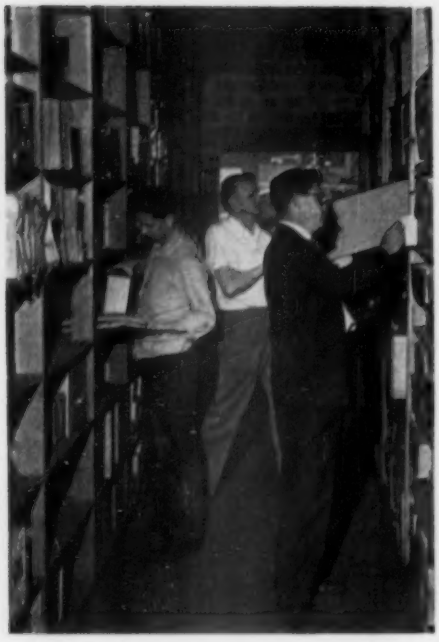
Price increases for California's heavy crude have spread to nearly all of the state's principal oil buyers after Union Oil kicked off boost. P. 77.

Industry

• **Hunt for U. S. oil** to fill the vacuum in Europe created by the Suez blockade has taken two new turns: Inland oil areas—including the Rockies and Wyoming—now are being tapped. And heavy, sour crudes are coming into their own because they're preferred by European refiners. P. 84.

One of biggest mergers of supply and equipment firms will take place when Emsco Manufacturing Co. and Continental Supply Co. become Continental-Emsco Co. January 1. Headquarters will be in Dallas. P. 73.

Wage increase of 10 per cent or more is the No. 1 goal of the new Federation of Independent Oil Unions. Goal is reflected in current negotiations by local members. P. 77.



Old files were checked, and . . .

Waste paper was sold. This beginning illustrates . . .

How Richfield Beat the Paper Problem

LOS ANGELES.—The familiar headache of mounting company paperwork has been relieved by Richfield Oil Corp. through a new venture in files management—a modern records center.

Paperwork problems are well known to integrated oil companies. They are continually swamped with every kind of mass record keeping—from royalty payments to credit-card billings.

Which of these records are to be kept and which thrown away? How can they be made available for easy reference without using too much valuable office space?

Richfield's answer is a controlled records-keeping program, installed with the aid of the National Records Management Council.

Specially trained personnel joined council representatives in a thorough housecleaning of files and records. This was done not only in the Los Angeles home office but also in field and division offices as far away as Seattle. The results were:

. . . **Destruction** of 39 per cent of all records. Twenty truckloads were sold as waste paper.

. . . **Removal** of 36.4 per cent of all records from office filing cabinets. These are now stored in a centrally located, low-rent records center. Modern record-keeping techniques make possible a speedy reference service for all departments.

. . . **A transfer timetable** under which additional records are transferred continually from various offices to the records center. Each department determines how long it shall keep its own records. The schedule is then checked by the department head, accounting and legal departments, and the secretary's office.

All records needed for operating, legal, and historical purposes are kept. Bulky documents sometimes are microfilmed. As a general rule, however, Richfield figures that low-cost storage for 20 years is about as cheap as microfilming.

What's good about it . . . The Richfield program is yielding benefits in three ways:

. . . **Office and storage space** is being enlarged by reducing office filing.

. . . **Filing equipment** is being recovered—and annual purchases of new filing equipment are dropping.

. . . **More efficient use** of company files is resulting from the system.

Before the new plan, Richfield was using more than 14,000 sq. ft. of storage space in four different locations. And each year more valuable floor space was being taken over for office files, to the detriment of regular department functions.

Establishing the records center reduced the storage space used for records by 7,000 sq. ft. The office space used for files was cut by 3,300 sq. ft. Added savings in office space are being realized as the system is extended throughout the company.

Cost of filing space in the record center is 96 cents per square foot per year. In the home office it is $4.50 per square foot.

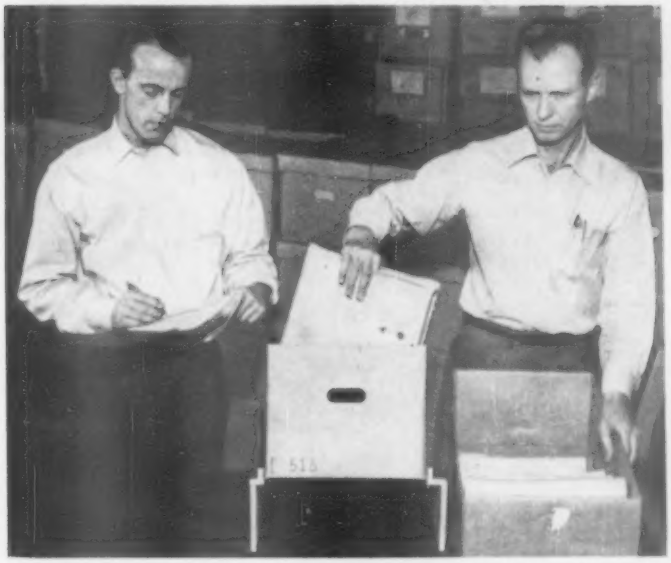
Savings in equipment have been equally outstanding. A 10 cu. ft. filing cabinet for the home office costs $140. The shelving and cartons for the same volume of material at the center cost $7.30. Annual expenses for office filing cabinets have been reduced from $20,000 to $5,000.

How change was made . . . The change-over began with a survey of Richfield's problem by the National Records Management Council, a nonprofit New York research, educational, and advisory service.

Its report convinced the company that important savings could be made under a new record-keeping system and record center.

To manage the new program, Richfield hired G. M. Derry, an experienced records supervisor and analyst with the U.S. General Service Ad-

New system works like this:



1 Records to be kept in central record center are itemized, packed in standard cartons. Index file makes it easy to locate any document.

2 Cartons are numbered. Boxes needed most often are placed in easy-to-reach spots. This requires less work than if documents were filed by industry division or company department.

3 Clerk with portable telephone gives quick answers. An executive with an inquiry usually gets a reply within 90 seconds.

ministration. For several months Derry and his staff worked closely with various offices and departments. With their wholehearted cooperation, the records system was completely overhauled.

By now the records staff has won the enthusiastic support of company departments through its demonstrated efficiency. When someone requests a particular document, a clerk checks its location through a card index. He then finds the correct carton on the shelves and is able to read the necessary information back to the inquirer by means of a portable telephone system. Average time for locating a record is 1½ minutes.

The cartons are not filed according to department. Frequency of use determines their location. Most-used cartons are nearest the index file and within easy reach without a ladder. A producing department file may be next to a carton containing refinery records.

If the inquirer needs to see the document, it can be delivered to him by a twice-daily courier service, or by special messenger if necessary. Photocopies of original records are furnished on request.

Department heads have found that records are handled more efficiently than before. In many cases a document can be found in the records center and used faster than if it were filed in the office. In searching out a less active paper, office personnel are spared a trip to one of the old warehouses. There the item could be found only after a long search, if it could be found at all.

"One of the most important jobs a records center faces is to sell itself within a company," Derry says. "We have prepared a booklet outlining our services, and conduct tours of personnel through the center. But the best selling point, as in any business, is to give good service."

STUDIES with this pilot plant may have opened a new field for refiners.

New Chemical Breakthrough for Petroleum Aromatics?

- New, simple direct-oxidation process points to a boom in petroleum-based chemicals from catalytic reformers. Two contracts already signed, others pending.

NEW YORK.—Petroleum aromatics are in for a major breakthrough in the chemical field. It will come about through a totally new approach in liquid-phase oxidation.

This was predicted last week by Scientific Design Co., Inc. S.D.'s new oxidation process is the one which Standard Oil Co. (Ind.) now owns world-wide and will use in Amoco Chemical Corp.'s $10,000,000 chemical plant announced recently *(The Oil and Gas Journal, November 26, page 55)*.

The new process has several advantages, according to Harry A. Rehnberg, Scientific Design's president.

It employs a simple, direct oxidation of basic aromatics, using air. The same plant can make a wide variety of dibasic acids merely by switching feedstocks. In fact, the process can handle mixed aromatics to make their respective dibasic acids. Such a thing has never been done before.

Pechiney, the big French chemical company, already has contracted with Indiana Standard to use the process. Another company in an undisclosed country also has contracted for use of the process, and two more companies are about to sign contracts.

Such plants will be licensed by Standard of Indiana, but will be engineered and built by Scientific Design.

Just how the process works was not revealed, since all patents have not yet been filed. But economic advantages of the process seem evident from the fact that Indiana Standard and others plan to put it to immediate use.

What's involved . . . Terephthalic acid is synthesized directly by oxidation of para xylene, para cymene, or para diisopropyl benzene.

Direct oxidation of meta xylene results in isophthalic acid. Ortho xylene becomes phthalic anhydride.

This seems to be only the beginning. S.D. has made a wide variety of oxidized intermediates from many basic aromatics, all available from petroleum sources.

These higher molecular weight compounds are far from laboratory freaks in that they have been made in pilot plants by the barrel. Economically they are still unknowns, however, since their end usage has not yet been investigated.

Versatile plant . . . While Amoco's initial plans seem limited to the manufacture of six intermediates, the plant to be designed for them by S.D. will make many more.

This is one of the principal advantages of the process, according to Dr. Ralph Landau, executive vice president of S.D.

The commoner intermediates such as phthalic anhydride, terephthalic acid, and isophthalic acid enjoy a rising demand for making synthetic fibers and plastics. But the market for these chemicals is known to fluctuate. The versatile process can be adapted to meet varying market demands merely by switching feed stocks.

S.D. sees in its process the means for bringing aromatic hydrocarbons from petroleum into the same high level of usage now enjoyed by petroleum aliphatics such as ethylene, propylene, and butadiene.

The availability of raw materials is unlimited. Every refiner with a catalytic reformer is making them. Mixed xylenes, for example, are now made in billions of pounds per year, mainly for blending to gasoline.

The prospects . . . For the demand standpoint the outlook is bright for aromatic intermediates.

There is a big dacron push under way which indicates that twice as much of this synthetic fiber could be marketed if it could be made.

Much the same situation exists for other fibers, films, resins, and plastics which are based on the oxidized intermediates from benzene, toluene, and xylenes.

The field is believed wide open for entirely new products in these classes from heavier dibasic acids which can readily be made by the new S.D. process.

Another important aspect of this new development lends self-sufficiency to the American chemical industry.

Roughly 10 million pounds of naphthalene, a coal-tar product, were imported this year to make phthalic anhydride. The S.D. process will tie this important intermediate and others more

closely than ever to the petrochemical field. It will further relieve the domestic chemical industry from dependence on foreign sources, some of which lie behind the iron curtain.

A U.S. first . . . S.D. originally thought of going into chemical manufacture itself with its newly developed process. But on careful appraisal, it decided in favor of a joint venture with an oil company which had plentiful raw materials.

Talks with Indiana Standard convinced S.D., however, that a company of Standard's size could most fully exploit all of the potentials of the process. The upshot was Indiana's purchase of 100 per cent ownership of the process. S.D. will design and engineer Amoco's plant as well as others which will follow.

S.D. attributes its success in finding the secret of direct liquid-phase oxidation to its small size.

Within the company, scientists, engineers, market analysts, salesmen, and management remain in close touch with one another. This resulted in their first lead, with market men telling scientists what was needed.

Having delivered, the scientists now look to world-wide application of this wholly American development.

Gas System Expands

Transcontinental nearing end of nine-state project

HOUSTON. — Transcontinental Gas Pipe Line Corp. is nearing completion of a $54,000,000 construction program to increase capacity of its transmission system for the winter heating season.

Main-line loops in Louisiana, Mississippi, Alabama, Georgia, South Carolina, Virginia, Maryland, and Pennsylvania are expected to be completed during the first week in December. A new compressor station in Louisiana is due to go into operation about the same time, and two others in Mississippi and Alabama will be completed early in 1957.

The 1956 construction program includes about 160 miles of 36-in. pipe and 68 miles of 30-in.

Addition of new facilities will increase capacity of the line for this heating season by 80,000,000 cu. ft. to 785,000,000 cu. ft. Deliveries from storage will boost peak-day throughput to 921,000,000 cu. ft. An additional 25,000,000 cu. ft. of capacity is to be added in 1957.

Much of the additional gas will be delivered to the New York City-New Jersey area.

watching WASHINGTON

. . . with Bertram F. Linz

Cooking for gas . . .

CONGRESS returns to Washington next month for the most important session since 1953, so far as oil is concerned.

More than a dozen pieces of legislation are already "cooking" in House and Senate committees. Not all will be favorable to the industry.

The importance of the session, however, lies in the coming move to relieve independent gas producers of federal control. Many in the industry are convinced that one great, last effort to get a bill through Congress must come next year. If it doesn't pass in 1957, they feel the cause will be lost.

The recent events in the Middle East will have a great influence on congressional thinking in the months to come. This will be apparent in talk about oil imports, synthetic fuels, and possibly naval petroleum reserves.

On the loss side, the industry will be faced with bills to control mergers, divorce refining from marketing, and stiffer acreage controls on public land leases.

Oil men may be kept busy running to Washington to tell their story. A number of investigations are indicated, some on bills that will be introduced and others to bring committees up to date on the state of the industry.

At last Alaska . . .

THE Interior Department may finally open up the big area in northern Alaska set aside for use of the Navy by President Roosevelt nearly 15 years ago.

The area north of Brooks Range was set apart under Public Land Order 82 as part of Naval Petroleum Reserve No. 4, cutting some 49,000,000 acres off from private development.

Lifting of the order was proposed in 1954 after long exploration by the Navy failed to find any volume of oil. The Navy said it was willing to give up the area added to the reserve, but it was a matter for the White House and Congress to decide. A Senate committee studied the matter, but took no action and Interior Secretary Douglas McKay refused to take the responsibility of releasing the lands.

Pressure to release the lands outside the reserve itself—which will remain in Navy hands—has recently increased. Alaskan interests are anxious to get a pipeline under way from Gubik gas field to Fairbanks. The field straddles the reserve boundary, but the Navy has no interest in gas and would not raise the issue of drainage.

A House subcommittee has been looking into the matter and may write a report early next year approving the shift which would open up more than 20,000,000 acres to private exploration and development. The exact extent of the vast wilderness reserve never has been measured.

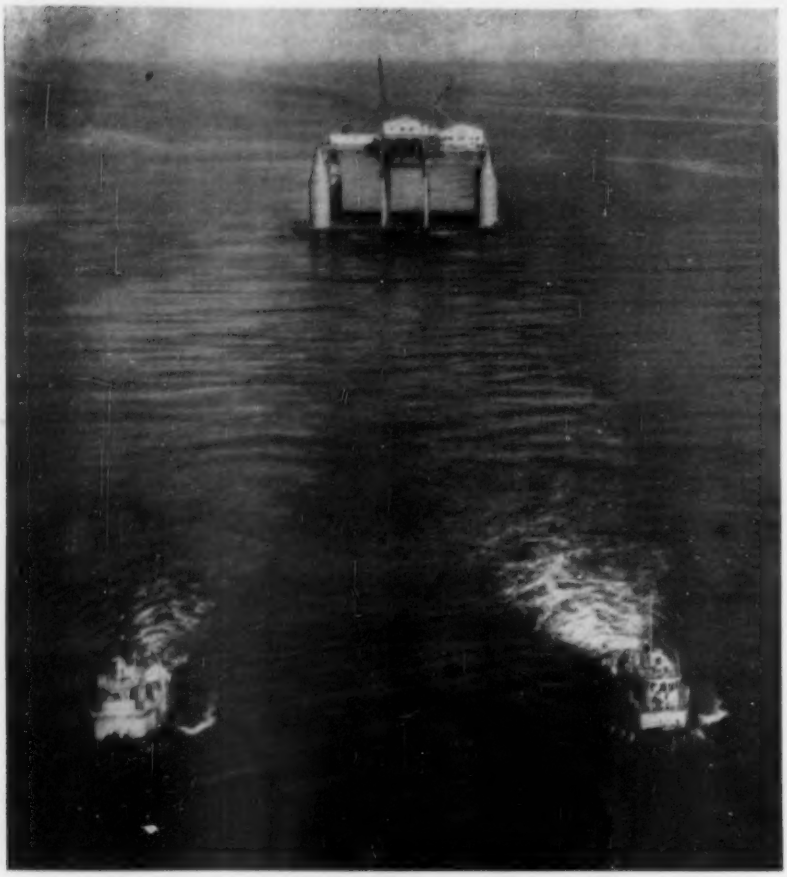
Navy pumps for shale . . .

ANY move in Congress next year to revive government research on synthetic liquid fuels will get strong moral support from the Navy.

Navy oil experts see the big shale reserves in the West as a future major source of heavy fuel oil (see related story on page 82). And despite the big interest in atom-powered ships, the department expects to run the greater part of its fleet on oil for years to come.

A supplemental supply of fuel from shale on the West Coast would make the Navy happier when it looks at its plans for the next war. Officials would like to see a shale-oil industry actually in being against that time. They believe it will be economically feasible in the not-distant future.

The Navy now holds the research plant formerly operated by the Interior Department. If the matter of synthetic fuels comes up, the department will be in there plugging.



Kermac's Rig 46 heads to first location.

Giant Barge Gets Shakedown

NEW ORLEANS.—Rig 46, the much publicized new submersible drilling barge of Kerr-McGee Oil Industries, Inc., so far is performing with flying colors in its maiden project in the Gulf of Mexico.

The crew was drilling below the 20-in. surface pipe last week at total depth of 804 ft. The well is a projected 13,000-ft. test for the C.A.T.C. Group on a structure in State Lease 1179 No. 1 OCS 0158. Depth of water is 54 ft. in Block 59 of the East Cameron area off the Louisiana shore.

The rig was towed to location by two tugs (see photo) from Pascagoula, Miss., where it was commissioned late in October *(The Oil and Gas Journal, October 29, page 64)*. Kermac officials said the barge, tallest afloat, made the trip like a veteran.

On location, the unusual equipment on the rig also got an initial test. The 14-ft. diameter steel tubes forming the base and the 22-ft. stabilizing columns at the four corners of the platform were flooded. This submerged the hull to the floor of the gulf where the weight of the structure gave it stability.

Drilling is over the side from a substructure that is cantilevered up to 55 ft. beyond edge of the deck. This feature will allow Kermac to drill up to six wells from this same location without moving off. The mast can be used as a construction boom to build production platforms.

A sister barge, Rig 47, currently is being outfitted at Pascagoula and should be ready for commissioning and a first project within a few weeks. Both are self-contained units and will need no auxiliary tenders.

Both pieces of equipment were designed to drill in water depths to 70 ft. Kermac officials estimated offshore drilling would be within that depth.

The barges are the latest in Kermac's pioneering offshore drilling ventures. The company in 1947 drilled the first discovery well out of sight of land in unprotected gulf waters and in 1950 used the first submersible barge in offshore drilling.

Octanes Inch Up

● Ethyl survey sees two more cities climb into top octane bracket

NEW YORK.—Octane ratings on both premium and regular gasoline, relatively stable since June, inched up again in November.

Ethyl Corp.'s latest monthly survey shows the weighted national average of premium gasoline at 97.3, up two-tenths of a number from October, and up 1.2 numbers from November 1955.

The weighted national average for regular was 90.3, up one-tenth from October and 1.5 numbers from November a year ago. The upward trend is a continuation of the October increase of one-tenth for both grades.

The latest survey saw two cities, Boston and Charlotte, N. C., move into the highest rating. Premium rating in the two cities advanced from 97.8 to 98.0.

Twenty of the 53 cities covered had regular gasoline of 90 or higher, compared with 18 cities in October.

PREMIUM

(Cities per octane group)

	Nov., 1956	Oct., 1956	Nov., 1955
90-90.9	0	0	1
91-91.9	0	0	0
92-92.9	0	0	1
93-93.9	2	2	3
94-94.9	2	2	9
95-95.9	1	3	14
96-96.9	18	18	19
97-97.9	26	26	6
98-98.9	4	2	0
Total cities	53	53	53
Wtd. ave. R.O.N.	97.3	97.1	96.1
Wtd. ave. TEL, ml. per gal.	2.54	2.59	2.52

REGULAR

(Cities per octane group)

	Nov., 1956	Oct., 1956	Nov., 1955
82-82.9	0	0	1
83-83.9	1	1	1
84-84.9	0	0	0
85-85.9	2	1	5
86-86.9	4	4	13
87-87.9	6	10	4
88-88.9	9	6	9
89-89.9	11	13	10
90-90.9	4	0	6
91-91.9	9	14	4
92-92.9	7	4	0
Total cities	53	53	53
Wt. ave. R.O.N.	90.3	90.2	88.8
Wtd. ave. TEL, ml. per gal.	2.18	2.31	2.27

Offshore Limits Extended

MORGAN CITY, La.—Gulf Refining Co. last week reported a gas and distillate discovery more than 40 miles off the Louisiana mainland in one of

the farthest seaward of any fields yet discovered.

The wildcat, a joint venture with Humble Oil & Refining Co., is in Block 176, Ship Shoal area. It is about 51 miles south of the Pointe Au Fer shoreline and some 44 miles southwest of the nearest mainland. The new discovery, 1-A OCS 0589, is about the same distance from land as The California Co.'s field in Block 160, East Cameron area, and approximately 4 miles south of big Block 154 field, where about 25 wells are producing oil.

The well flowed 1,780,000 cu. ft. of gas, with a trace of distillate in a 50-minute drill-stem test. Production is from perforations at 6,820-26 ft. Flowing pressure was 2,540 psi. Sidetracked by a fishing job below 12,000 ft., the discovery was bottomed at 12,438 ft. Location is in about 95 ft. of water.

Imports-Tiff Preview

Rep. Byrd opens battle to push quota law in Congress

WASHINGTON.—The first gun in the 1957 fight for a quota on oil imports was fired in Washington last week by Rep. Robert C. Byrd of West Virginia.

"Regardless of which way events may turn" in the Middle East, a quota law should be passed at the coming session of Congress, Byrd declared.

He charged that the voluntary program has not kept imports at a sensible level. "Hesitation and indecision" in the Government have actually encouraged a stepup in imports of residual oil, he said.

"Despite the fact that a severe fuel shortage is rapidly developing throughout Western Europe as a consequence of the Suez tie-up, current shipping schedules for residual oil from South America do not indicate any immediate letup in the deluge of this fuel into East Coast markets," Byrd declared.

"The picture reflects a grave injustice to the oil industry, an injustice that must be remedied through the medium of quota legislation."

I.P.A.A. stand . . . The need for action on import controls also was stressed by officials of the Independent Petroleum Association of America who met in Washington last month to discuss the impact of the current Middle East situation on the domestic industry.

Domestic producers can meet all demands from the 2,000,000 bbl. daily of shut-in capacity "built up despite inadequate funds and markets resulting from excessive imports," Robert L. Wood, president of the I.P.A.A., said after the meeting.

Oil Research Cost Rises

Industry invested $161 million last year in new ideas; but sum is still far less than other industries spend

OIL companies spent nearly $161 million for research and development last year, and the outlay is expected to grow even greater in the future.

Statistics on the cost of oil research were gathered in an American Petroleum Institute study of 75 companies representing more than 90 per cent of all research and development in the industry.

Expenditures of $160,918,335 for 1955 were more than 15 per cent above the $137,966,686 reported spent by 76 companies in 1954.

Oil still lags . . . Impressive as the figures are, they still are only a fraction of the nation's $4 billion research bill for 1955. That figure was increased by heavy government participation.

However, in the industrial area, oil companies still trail other major industries by a large margin.

The U. S. Bureau of Labor statistics reports this research spending in 1954: Chemicals $390 million; machinery $343 million; electrical equipment $823 million; aircraft $915 million; professional and scientific instruments $190 million; telecommunications and broadcasting $126 million; fabricated machinery $107 million; and other manufacturing, including motor cars, $654 million.

In the fields of aircraft, electrical equipment, professional and scientific instruments, government - research participation ranged from 50 to 80 per cent. Despite this factor, the purely industrial research expenditures were well above the sums spent by oil.

Where it goes . . . Refining and manufacturing took the biggest share of oil's 1955 research dollar, a big 49 per cent.

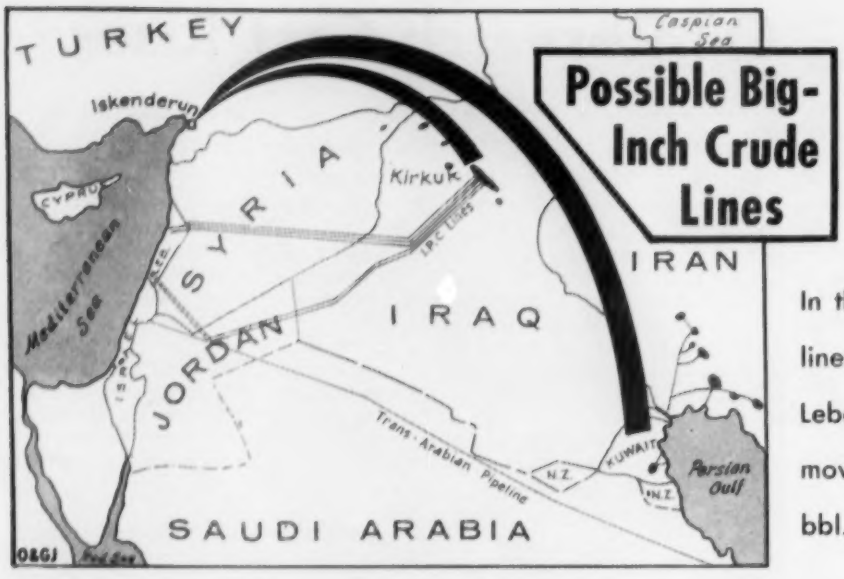
Other divisions shared like this: Exploration and production, 21 per cent; petrochemicals, 16 per cent; equipment supplying, 4 per cent; transportation, 1 per cent; and others, 9 per cent.

The A.P.I. report revealed that 52 per cent of the oil-research spending went toward developing new products and processes, 37 per cent for improving existing products and processes, and 11 per cent for fundamental research.

Oil Industry Research and Development Expenditures

	1955		1954	
	Companies reporting	Amount	Companies reporting	Amount
Performed within the company	72	$156,803,491	71	$134,612,105
Performed outside by:				
Commercial laboratories	33	1,090,510	31	721,394
Educational institutions	26	1,069,478	24	1,125,210
Other nonprofit organizations	20	1,550,632	21	1,403,864
Total	52	*4,114,864	52	*3,354,581
Total expenditures	75	160,918,355	76	137,966,686
Expenditures within the company by industry division:				
Exploration and production	29	30,076,651	30	27,189,766
Refining and manufacturing	45	69,693,385	46	66,647,727
Transportation	7	403,073	7	340,167
Equipment manufacturing	17	6,061,682	15	5,336,598
Petrochemicals	30	23,467,512	30	18,023,678
Other	8	15,230,495	9	13,090,602
Total†	70	144,932,798	70	130,628,538
Expenditures within the company by type of expenditure:				
Improvement of existing products or processes	63	53,148,953	64	49,430,412
Development of new products or processes	65	75,348,894	65	67,183,637
Fundamental research	38	15,769,178	35	13,512,665
Total†	66	144,267,025	67	130,126,714
Research and development capital expenditures	55	26,672,722	53	14,370,305

*Total includes $404,244 in 1955 and $104,113 in 1954 which was not broken down.
†Does not equal the total given for research and development performed within the company because some companies gave no breakdown.



In the talking stage are lines which would skirt Lebanon, Jordan, Syria, move over 1,000,000 bbl. to Mediterranean

Big-Inch Lines Through Turkey Studied

PROPOSALS for new pipelines from the Middle East to the Mediterranean and expansions of current projects are very much alive in spite of sabotage to the Iraq Petroleum Co. arteries.

The economics for pipeline movement were never more attractive. And the Suez Canal closing, which forced rerouting of more than 1,500,000 bbl. per day, is only one of the reasons.

Events the past few weeks have not killed any pipeline plans. They have altered some, accelerated others. As of now, here is the situation:

. . . Two superinch lines are under active study, both to extend north through Iraq, then westward across Turkey to the Mediterranean. One would originate in Iraq at Kirkuk field, the other at the head of the Persian Gulf.

. . . Trans-Arabian Pipe Line Co. (Tapline) is going ahead with a 90,000-bbl. expansion to bring capacity to 410,000 bbl. daily by 1958, perhaps earlier.

Troubles with Syria and Lebanon are regarded as only the latest in a long series of upsets in the area. They may be only "temporary."

Economic and political considerations will determine the selection of routes for future pipelines that are certain to be built. The idea of more lines following the same routes now used by I.P.C. and Tapline is not dead.

The immediate need for these lines is obvious. It will not diminish even when Suez is reopened. With three-fourths of the free-world's reserves and only one-fourth of its current production, the Middle East will have still greater need for more pipelines as it assumes a larger role in the world supply picture and as Suez reaches its approaching capacity. Already nearing 4,000,000 bbl. daily, the Middle East is just beginning to realize its potential.

New pipelines . . . The route for a line from Kirkuk field to Iskenderun, Turkey, has already been surveyed

On-the-spot studies on the other project will be stepped up as soon as the present crisis subsides and more normal travel is possible.

The line from the head of the Persian Gulf would be about 1,000 miles long, roughly the same as the Tapline-Aramco system which originates in Saudi Arabia and passes through Jordan, Syria, and Lebanon.

Million-barrel throughput might be possible with 36-in. pipe (Tapline is 30-31 in.). But 38 or 40-in. is considered more economic and thus more likely, depending on its availability.

Steel is a major problem. U. S. mills are booked solid through 1958, and big tonnages might not be available, unless diverted from other projects, before 1960. Foreign mills are in about the same shape.

The combination of the pipe-mill situation and the high costs of shipping pipe has raised the possibility of fabricating 40-in. in the Middle East. Location of a pipe mill there might speed up the projects.

In the early planning of Tapline, in 1947, serious thought was given to setting up pipe mills on deck of one or two war-surplus aircraft carriers, according to Burt E. Hull, first president of Trans-Arabian Pipe Line Co. He has pointed out that one could be at the Mediterranean and the other at the Persian Gulf.

While the cost of pipe making would be greater, the freight cost would be reduced one-half to one-third. This would be sufficient to more than justify the operation. Later such a floating pipe mill might serve projects in the United States.

Companies affected . . . The owners of Kuwait Oil Co., Ltd., (British Petroleum-Gulf) would benefit most from a pipeline outlet.

Being the Middle East's largest producer and shipper through Suez (78 per cent of its output goes through the canal, accounting for more than half of all Suez oil shipments), Kuwait has suffered most from its closing.

Iran (with British Petroleum the dominant consortium company) is the Suez's second-best customer. Iran also lacks a pipeline to the Mediterranean. Its need for a guaranteed outlet will increase as production returns to the prenationalization level.

British Petroleum has the biggest stake in the Middle East and hence the greatest incentive to build a pipeline to assure a continued flow of oil.

I.P.C. (owned by B.P., Royal Dutch-Shell, Cie. Francaise des Petroles, Jersey Standard, and Socony Mobil) now badly needs an alternate route around Syria and Lebanon.

Arabian American Oil Co. (Standard of California, Jersey, Texaco, and Socony) might wish to utilize an alternate route for the same reason.

I.P.C. is suffering from dependence on limited outlets. Syria, a nonproducing country which is demanding more and more for transit rights across its territory, literally has I.P.C. by the throat. It can prevent repair of the blown-up stations and stop the 500,000-bbl. daily flow of crude for as long as it desires to cripple the British and French.

Tapline, being American owned, has escaped the sabotage suffered by I.P.C. as a result of the British-French occupation of the canal zone in Egypt. Early reports of curtailed Tapline flow proved false. In fact, Tapline has been delivering 340,000 bbl. per day, 20,000 bbl. above rated capacity.

Like I.P.C., Tapline has been subjected to exorbitant transit demands by the nonproducing countries.

The Iraq-Turkey route is not without its own political problems, however. But these are not insurmountable. Its big advantage is that the only nation crossed which does not have a direct stake in the lines is Turkey, a pillar of NATO. And while transit agreements remain to be negotiated, it appears that the companies would much prefer to have the fate of their vital oil arteries in the hands of Turkey than Syria, Lebanon, and Jordan.

Tapline economics . . . Tapline is a perfect example of a successful pipeline.

Its success is little short of amazing in light of the conditions under which it operates.

Built at a cost of $230 million, the line may be estimated to have returned out-of-pocket costs in 8 months. Straight operating costs originally were less than 4 cents per barrel, and the new outlet made it possible for Aramco to produce more oil. It freed 80 small tankers for other trade-routes.

Engineers believe the line could still be duplicated at no greater cost than that of the existing line. Almost half the original cost was incurred through delays in receiving a U. S. pipe-export permit and transit rights from Syria. According to Hull, the economics for new pipeline capacity in the Middle East were never more favorable.

Tapline capacity is being increased through installation of four 5,000-hp. gas-turbine auxiliary pumping units. The added 90,000 bbl. of capacity will be gained with an investment of only $14 million. Extra-heavy wall pipe was laid to permit maximum expansion. It is estimated that capacity could be raised another 90,000 bbl. to 500,000 bbl. daily by adding five new stations instead of the boosters.

EUROPEAN LINE already planned would further lessen dependence on tanker movements. It could handle much of any oil moved to Iskenderun by proposed big-inch Middle East lines.

But increasing capacity through horsepower is only a second choice. Although the initial outlay is smaller than for looping, operating costs are higher. It takes far more operating expense to achieve the increased throughput than would be required if the line were looped.

New stations mean more personnel, building whole communities. One such community has grown to 10,000 persons, including 30 to 40 crewmen, their families, and persons supported by the station activity, not to mention the 25 to 100 soldiers which must be hired to guard the station and the Bedouins who settle there for free water.

Several independent studies of major companies have shown that pipelines can contribute to lowering the transportation cost of Persian Gulf crude. Steel and machinery requirements are less than for an equivalent tanker haul. Construction and operating costs favor pipelines unless they are complicated by political expenses.

Tankers or pipelines . . . Looking ahead to the next few years when Middle East production will increase sharply if it remains in free-world hands, tanker-minded people discount the feasibility of more Middle East pipelines. Here is part of their reasoning:

The tanker solution to the transportation problem is flexible because if the canal is closed, the oil flow may be reduced by longer routes but it is not shut off. Tanker advocates argue that pipelines through unfriendly territory are more vulnerable, and when trouble arises are likely to suffer the experience of I.P.C.

Advocates of the pipeline solution point out that routing supertankers around the Cape of Good Hope, while perhaps economic, is no basis for a permanent solution. Fleets would have to be increased 50 per cent to carry the same volume of oil west of Suez and fuel-oil terminals would have to be built for the cape route.

It looks as though from the long-range viewpoint, beyond the near future, the industry will be getting away from dependence on the Suez Canal.

Trans-European line . . . The pipeline solution is emphasized by plans for a Marseilles to Wilhelmshaven line to be built primarily by Middle East producers who refine and market in Western Europe.

It would cut the eastern Mediterranean to North Sea haul about in half. This 700-mile, 30-in. line, or one of larger diameter, would reportedly have initial capacity of 480,000 to 670,000 bbl. daily. It could be raised to 800,000 bbl. There is a possibility of a larger diameter capable of 1,000,000 bbl. per day throughput.

The Wilhelmshaven to Cologne system is the most definite. It can be independent of the remainder of the line. It will be built by a group of six West German refiners headed by Jersey Standard and British Petroleum. The 200-mile section, with capacity of 400,000 bbl. daily, is to be completed by early 1959.

The outlook . . . Possibilities of new pipelines should be considered in light of the fact that there has been trouble in the Middle East before and there will be more in the future.

The area has been in turmoil for centuries. It has almost come to be regarded as the normal state of affairs.

By the same token, international companies, operating in the shadow of the Russian bear, are accustomed to its growling, too. They recall Russia's withdrawal from Iran after World War II under the pressure of world opinion exerted through the United Nations.

What they expect is many years of trouble fomented from two sides:

. . . Colonel Nasser's Egypt, which is trying to use Russia to further its own Middle East and African ambitions.

. . . Russia itself, which can be counted on to provoke new crises at every possible opportunity through nationalists in "have-not" Arab countries, by subversion of local Communists, and by diplomacy.

In the meantime, Middle East companies expect to keep increasing production to supply growing world markets. And how to transport that production is one of the major problems with which they are wrestling now.

Louisiana Jumps Output

Another 100,000 bbl. daily boost in December allowable is ordered; production in Oklahoma also will go up

LOUISIANA boosted its December daily oil production allowable another 100,000 bbl. last week. This means the state will produce a record 973,471 bbl. daily during the month.

Conservation Commissioner John B. Hussey explained the increase was ordered because of heavy demands for Louisiana crude to replace oil lost in the Suez blockade.

Hussey's action sent the state's daily allowable 200,000 bbl. higher than it was before the Suez crisis. Last month Hussey authorized a 75,000 bbl. allowable increase for the rest of November and a preliminary 25,000 bbl. boost for December. Another 100,000 bbl. daily boost was added last week.

The Louisiana official declared "this is not as far as Louisiana production can go." He added: "But it will probably represent our full share of any oil production increases."

Oklahoma output up . . . Meanwhile, Oklahoma operators learned last week their production also will rise in December — probably approaching the 600,000 bbl. daily level.

But just how much the increase will be and how it will be proportioned was being debated by the Oklahoma Corporation Commission late in the week.

Oklahoma Conservation Director Massena Murray at an allowable hearing in Oklahoma City last Tuesday recommended that the basic allowable be retained for the next 2 months. This would allow production to increase at least 15,000 bbl. daily. About 5,000 bbl. of this would go to operators with new production and the rest to those who have suffered underproduction this year.

Murray estimated this would result in actual production of 575,000 bbl. daily in December and January and could go much higher depending on how much underproduction can be run. The commission was still studying the proposal last Friday with reports prevailing that it favored hiking the allowable.

Production for the first 17 days of November has averaged 576,338 bbl. daily but the month's average is expected to be only 560,000 bbl. October production averaged 550,641 bbl. daily.

Purchasers nominated 568,094 bbl. daily for the 2 months, an increase of 17,682 bbl. over their November nominations.

But the buyers who indicated they need increased supplies all requested that the stepped-up amounts come from underproduction.

OKLAHOMA ALLOWABLE hearing drew a packed house of crude buyers and oil operators last week when the Oklahoma Corporation Commission heard arguments whether to increase production from the state's oil wells.

Murray estimated total underproduction for the year has reached 2 million barrels. He said only about half of this can be made up because wells are unable to produce at that rate. He said he hopes that purchasers can take 10,000 bbl. daily or more of this underage in the next 2 months. Thus at least 600,000 bbl. could be worked off.

At least two of the major buyers reported they were even with November allowables and had started running underage already. Five major buyers who in the late summer instituted purchaser proration either have lifted the restrictions or plan to do so.

The outlook . . . Purchasers and producers alike warned the Oklahoma commission that inland states will not benefit from the Middle East situation as quickly as states on tidewater.

Roland V. Rodman, president of Anderson-Prichard Oil Corp., pointed this out briefly in asking the commission and industry to cooperate on a broad program. He cited excessive gasoline stocks of 20 million barrels, excessive distillate stocks of 11 million barrels, and crude stocks 25 million barrels higher than a year ago.

He said these stocks have resulted in price reductions in the Southwest and have brought on loss of actual production. He advised that the industry should get back on an even keel before allowables are boosted.

The independents . . . Two independents, Gus Delaney and Mack Braly of Ada, urged that allowables be increased and that all operators share the increase with those who have underage.

Both declared "now is the time to raise allowables," and cited production increases ordered by Louisiana, Texas, and New Mexico. They argued that buyers "after the Middle East thing gets back to normal will want to reduce allowables." They added: "We had better raise them now so we can cut them later instead of keeping the same figure and then have to reduce even that later."

Delaney and Braly asked that the maximum allowable for unallocated pools be raised from 20 to 25 bbl. daily and a 10 per cent increase be made for allocated pools.

Delaney said records show that 240,000 bbl. of underage in the state is held by Phillips Petroleum Co. He declared it was unfair to let Phillips make up that production and not raise allowables "when it was Phillips which partly contributed to the situation" by starting purchaser proration.

Tighter rules . . . During the hearing Murray also warned the industry the commission may institute stricter regu-

lation on production from secondary recovery and exempted wells and fields.

Murray said that at the next hearing he will ask that operators of water-flood projects be required to report pipeline runs for the previous 6 months and make a similar report monthly.

The new report form also will require an outline of the flooded area, the average depth of wells, location and number of input and producing wells, amount of water injected and oil produced daily along with both the minimum and maximum efficient rates of production.

Murray said the conservation department plans to make a survey of all secondary recovery projects, then attempt to classify them and work up a formula for placing them under allowables. He explained it is possible these projects are producing more than their share of the Oklahoma market.

Murray declared water-flood projects now are yielding about 85,000 bbl. daily. Oil production from salt-water injection wells averages about 15,000 bbl. daily. He added that salt-water exemption wells produce another 20,000 bbl. daily. Thus about 120,000 bbl. daily of the state's production is outside the allowable formula.

The conservation director informed the purchasers that a hearing probably will be held in March to give everyone a chance to be heard on any proposal of classifying the projects and fixing allowables.

New yardstick . . . The entire yardstick for setting Oklahoma allowables came under fire during the hearing from James H. McGowan, attorney for Sinclair Oil & Gas Co., one of the state's major producers.

McGowan said the "present pattern of allowables is out of kilter." He said under the present yardstick a 2,000-ft. well and a 5,200-ft. well have the same 20-bbl. daily allowable, but the costs of drilling the deeper producer are many times higher.

McGowan asked the commission to give more weight to costs, with higher allowables to deeper wells. He explained "to keep Oklahoma a big producing state we need new reserves and these reserves are deep." Higher allowables for the costly wells would be an inducement to exploration.

McGowan also proposed that allowables be set for individual pools instead of on a state-wide basis. He declared the state-wide method results in "gearing the entire state's production to the demand for southern Oklahoma crude, which annually has a seasonal slack period."

He said "we are penalizing the rest of the state which has a demand because of lack of demand from an isolated section."

Pipeline BRIEFS

Powder River Pipeline Co. has withdrawn its application to build an 18-mile, 6-in. crude line to connect Donkey Creek field, in northeastern Wyoming, with Butte pipeline. The withdrawal was announced just before a hearing by the Wyoming Public Service Commission was to begin. The commission took under advisement a competing application by R. H. Fulton Co., Lubbock, Tex., for a 39-mile line from Donkey Creek to the Osage pump station.

Houston Contracting Co. is nearing completion on 120 miles of 20-in. for Texas Gas Transmission Corp. from near Eunice, La., east to the Thibodaux, La., area. The work is being handled by three spreads. A 50-mile section from Eunice to New Iberia is to be completed by December 10. The 45 miles from New Iberia to Morgan City should be in by December 15, as will the final 25-mile segment ending at Thibodaux.

Work will start on Houston's 131-mile, 30-in. spread for Texas Eastern Transmission Corp. around March 1, depending on receipt of pipe and materials. The spread will extend from near Angleton, Tex., east to near Vidor, Tex.

Robert G. Foreman of Whittier, Calif., has formed a Nebraska firm to fabricate and sell steel pipe for natural gas, oil, and water uses. The plant, to be known as Lakewood of Nebraska, will be built on a 5-acre tract at the southeast edge of Hastings. The firm also has an option to buy an adjoining 20 acres. Foreman said he expects the plant to be in operation by January 1, producing steel pipe of ¼-in. to 16-in. in diameter.

Interprovincial Pipe Line Co.'s 1,800-mile crude system from Alberta to Sarnia, Ont., will be extended next year to Toronto where it will supply increased refinery capacity. T. S. Johnston, Interprovincial president, said the 151-mile extension will be 20-in. and will carry 40,000 bbl. daily.

Construction is to start in May with completion scheduled by October. The remainder of the $22-million, 1957 program includes 32 miles of 26-in. loop between Regina, Sask., and Cromer, Man., and 80 miles of loops on the U.S. part of the system. Pumping stations will be built at Indian River and Gold City, Mich., and between Edmonton and Regina. The Interprovincial system is now handling around 195,000 bbl. of crude daily from Edmonton.

Montana Power Co. has completed a 75-mile, 6-in. natural gas line from Montana's Big Coulee gas field to the towns of Lewiston and Harlowton. O'Connor Construction Co., Fromberg, Mont., was the contractor.

Humble Pipe Line Co. has let contract to Lone Star Construction Co. to build 94 miles of 18-in. crude line from Ector station to the Kemper station in West Texas. It will join Humble's main line to the Gulf Coast. Completion is scheduled for February 1.

Also for Pipeliners . . .

Transcontinental Gas is winding up a $54-million expansion that will enable the company to increase deliveries in the New York City-New Jersey area (P. 63) . . . Several big Middle East pipeline projects are in the talking stage. They include: A big-inch line from Iraq's Kirkuk field to the Mediterranean port of Iskenderun, Turkey; another line from the head of the Persian Gulf to Iskenderun; and increasing the capacity of Tapline 90,000 bbl. to 410,000 bbl. daily (P. 66) . . . Trans-Canada has outlined plans to sell $120 million worth of debentures and common stock (P. 72) . . . Pacific Northwest has completed its main line from the San Juan basin to the Canadian border (P. 74) . . . The FPC is expected to decide soon on two gas lines which are slated to move Texas gas to Florida's markets . . . American Louisiana has signed up new gas reserves (P. 78) . . . Rangeland Pipe Line Co. has received approval to build a line to move crude to Edmonton (P. 82) . . . More crude is moving to the Gulf Coast as Europe's fuel supply dwindles (P. 84).

PLUS THESE TECHNICAL FEATURES: How to plan a microwave radio-relay system; Part 2 of a series (P. 127) . . . and Pipeline Patrol tells how compressors set pipeline flow rate (P. 145).

Tax Issue Cleared Up

Mineral rights don't revert to counties when owner of rights fails to pay taxes on them, Montana court says

HELENA, Mont.—The Montana Supreme Court has ruled that counties in the state cannot take over mineral rights on lands for unpaid taxes assessed against such rights.

The unanimous opinion upheld a District Court decision which disallowed Golden Valley County's claim to mineral rights on three tracts of land because the owners had not paid taxes on "mineral rights under the said lands."

The high court's ruling has direct bearing on several similar cases filed in District Courts since the Williston basin oil boom in eastern Montana.

The case history dates back to 1912 when Three Forks Land Co. sold the land in question. However, it reserved "all minerals of any nature whatsoever upon, in, and under all said lands, and also the use of such of the surface ground as might be necessary for exploring for and mining or otherwise extracting and conveying away the same."

Three Forks later sold these mineral rights to Decella Adams, who subsequently disposed of them to C. M. Hall. Mrs. Adams reserved to herself a 2½ per cent royalty on any oil and gas which might be discovered.

Dual taxes . . . Golden Valley County then assessed the mineral rights and served tax notices on Mrs. Adams and Hall. The surface land, meantime, had been assessed independently for purposes other than mining.

Mrs. Adams and Hall refused to pay the assessment on the mineral rights and the county assumed title to them. They were later sold to Harold Lehfeldt.

Mrs. Adams and Hall asserted their claims to the mineral rights after Williston basin became an oil-producing area. Lehfeldt went to District Court with a quiet-title petition and Golden Valley County intervened on his side.

Mrs. Adams and Hall readily conceded that Lehfeldt owned the surface ground, but contended all minerals in and under the lands belong to them.

Other rights . . . The defendants also established that Lehfeldt's ownership of surface land was subject to their "right and privilege to the use of such surface ground as may be necessary for exploring for and mining, extracting, and carrying away all minerals under the land specifically described."

The tribunal pointed out that the county could legally tax "the right to enter upon the lands to explore for minerals and extract the same where found," but that the county had not done this.

"The assessment upon the minerals in place was void and no valid tax title passed as to the minerals," the Supreme Court opinion, written by Associate Justice Albert H. Angstman, stated. "Since the right to use the surface for mining purposes was not taxed, no valid tax title could issue divesting the owner of that right."

Offshore Deadlines Eased

NEW ORLEANS.—Offshore oil operators have received an extension of time in which to complete drilling obligations on Gulf of Mexico leases affected by the U. S. Supreme Court's shutdown order.

P. R. Beach, manager of the Interior Department's Outer Continental Shelf office here, announced extensions for 264 leases in the disputed area covered by the court order of last June 11. He said extensions would range up to 124 days, depending on how long the suspension order prevented the development of individual leases.

The order was lifted October 12 under terms of an agreement between Louisiana and the federal Government. Since then activity in the area has approached its former pace.

Even with the extensions, 47 leases in the disputed area were scheduled to expire by end of the year.

Winter Aids Alberta Search

CALGARY.—Alberta may be in for a record winter of exploratory drilling, with the northern section of the province as the main objective.

Oil companies were busy all summer building access roads in preparation for the freezing of muskeg. Prospects brightened in the north last winter when Union Oil Co. found production in the relatively untapped granite wash formations.

The Alberta Mines and Mineral Department reports 160 drilling rigs are currently active in the province. Of these, 68 are drilling exploratory wells.

The percentage of wildcat drilling, which is already high, will probably increase as more rigs move off development projects to take advantage of the winter freeze-up in the north.

Plant Site Optioned

Gulf is studying possibility of South Carolina refinery

PITTSBURGH. — With over 3,000 acres under option, Gulf Oil Corp. is studying the possibility of building a refinery near Charleston, S. C. The property is located in Christ Church Parish, Charleston County.

Gulf has no immediate plans for the refinery, but work is under way to determine what size and type of plant should be built. This long-range project has been under consideration for some time as a means of supplying Gulf's southeastern markets with petroleum products.

At one time a products pipeline was contemplated from the Port Arthur area. However, Gulf's projected plans to use its foreign oil reserves favored adding new refining capacity on the East Coast. The major Philadelphia refinery, now boosted to a capacity of nearly 200,000 bbl. per stream day, poses a space problem in further expansion.

This has led the company to consider a new refinery site on the East Coast. Gulf now operates five refineries, at Port Arthur, Philadelphia, Staten Island, N. Y., and Cincinnati and Toledo, Ohio. Last year more than 526,000 bbl. per day was processed at these five locations.

Navajo Cash Register Sings

WINDOW ROCK, Ariz.—Standard Oil Co. of Texas was high bidder at the third and final November sale of oil and gas leases on 151,465 acres of Navajo Indian land in the Four Corners area.

The Navajos have netted $33,686,327 in lease money from the last three sales. This nearly equals the $41,000,000 received from all Indian land lease sales in the nation during the fiscal year ending June 30.

Texas Standard's high bid at the last sale was $123.11 per acre for 2,560

acres northwest of the Bisti field in west central San Juan County, New Mexico. Total bonus for all 61 tracts sold at the third offering was $2,963,051. No bids were received on about 7,000 acres.

The most lucrative of the three sales was held November 1, when tracts near Utah's Aneth field—latest hot spot in the Rocky Mountain area—attracted $27,476,216 in lease money *(The Oil and Gas Journal, November 12, page 135)*.

Atomic Boost Eyed

Esso to step up radiation strength of lab at Linden

NEW YORK.—Esso Research & Engineering Co. is preparing to beef up the radiation strength of its new atomic laboratory at Linden, N. J.

Company officials say a stronger source material is needed to meet the growing demands for radiation use.

When the lab was first put in operation 18 months ago, it used a small length of radioactive cobalt pipe with an intensity of 3,200 curies. At that time, this was the highest activity ever installed in a private industrial laboratory.

But the cobalt isotope has a half-life of 5.3 years. It has since decayed to a strength of about 2,600 curies. This lessening of intensity, plus the growing demand for "time" in the hot lab calls for a new stronger source.

More protection . . . A stronger radiation source means additional shielding will be necessary to maintain the same high level of protection for workers.

Esso workers already are installing additional shielding around the test cell. The storage well also is being enlarged.

So far, the heavy concrete shielding has provided such protection that none of the film badges worn by men working in the cave area has shown measurable amounts of radiation. This means that those working in the area for the past year and a half have received less radiation than they would from a simple chest X-ray.

Coordination of time in the hot lab will continue to be a problem. However, a stronger source is expected to cut the required exposure for individual projects. In the program to date, the cobalt pipe has been in actual use 88 per cent of the time, on a round-the-clock, 7-days-a-week basis.

Esso is now looking at new sources. It has not yet decided what type of source will be installed, nor its activity. Delivery, cost, and half-life of numerous radioactive materials are being weighed in the final decision.

Processing Briefs

Texaco is following the beefed up premium route. It has introduced a new premium grade called Texaco Sky Chief Su-Preme to supplant the former premium grade. The new high grade will boast the Petrox additive, additional octane rating, and improved volatility, according to S. C. Bartlett, vice president for domestic sales.

It will be available December 1 in metropolitan New York, Long Island, Westchester County, all of New Jersey, Boston, Providence, New Haven, Hartford, New London, Philadelphia, Pittsburgh, Norfolk, Miami, Mobile, Houston, and Port Arthur. By mid-December it will be marketed in 20 additional areas. Texaco's regular grade will remain unchanged.

A new 11,000-bbl. Ultraformer is now in full production at Standard Oil Co. of Ohio's Cleveland refinery. Constructed by Fluor Corp., Ltd., the unit catalytically reforms charged naphtha to produce high octane gasoline. A common Ultraformer furnace, consisting of five preheat and reheat sections in a single box, was incorporated into the unit, marking one of the first installations of this type.

A $5,000,000 anhydrous-ammonia plant will be built at Huron, Calif., by Ammonia Chemical Corp. of California and Monterey Oil Co. Construction is to start in January, with completion scheduled for about a year later. The plant site is adjacent to a railroad and the main Texas gas transmission line of Pacific Gas & Electric Co.

A combination Catformer and Unifining unit with a 1,000-bbl. daily capacity is going up at Dorchester Corp.'s gasoline plant at White Deer, Tex., near Amarillo. It will upgrade depentanized natural gasoline to 97 octane. An isopentane blend will bring the octane rating to 98-plus. The unit is being built by Grebe & Doremus Process Co. of Houston.

Imperial Oil, Ltd., is getting set to boost capacity at its 9,200-bbl. Calgary refinery to handle a new source of crude from Sundre field. Plans haven't jelled yet, but the company has applied to the Calgary Technical Planning Board for purchase of a 300-acre tract adjoining the refinery site.

Anderson-Prichard Oil Corp. of Oklahoma City is building a 3,000-bbl. propane deasphalting unit at its 15,000-bbl. Arkansas City, Kans., refinery. Completion is expected late in 1957. Contract for construction of the unit was awarded to Badger Manufacturing Co. of Cambridge, Mass. The process is licensed by Esso Research & Development Co.

Humble Oil & Refining Co. has announced plans to construct a low-temperature gas recovery unit at its Baytown refinery. Construction is scheduled to begin about May 1957 with completion due early in 1958. A letter of intent has authorized M. W. Kellogg Co. to proceed with engineering work on the unit.

Humble also plans to build the first of four ethylene recovery towers at Baytown.

Also for Refiners . . .

Petroleum aromatics are expected to come in for a big play in the chemical field as result of the new liquid-phase oxidation process developed by Scientific Design and sold to Standard of Indiana (P. 62) . . . Ethyl's November survey sees octanes inch up and two more cities climb into the 98-plus bracket (P. 64) . . . Oil's spending for research and development continues to grow (P. 65) . . . Gulf has optioned 3,000 acres outside Charleston, S. C., as a possible refinery site (P. 70) . . . Esso Research & Engineering will boost the radiation strength at its Linden laboratories (P. 71) . . . The year-old Federation of Independent Oil Unions is shooting for "not less" than a 10 per cent wage increase with a minimum hike of 25 cents a hour (P. 72) . . . Small refinery goes on stream at Carrizo Springs, Tex. (P. 73) . . . Four of 11 major units are on stream at Tidewater's Delaware City refinery (P. 77) . . . Colorado's congressional delegation will seek reactivation of shale-oil research at Rifle . . . Humble's Baytown refinery workers are voting on new 2-year contract (P. 82) . . .

PLUS THESE TECHNICAL FEATURES: A panel of experts answers questions and gives timely tips on refinery operating practices (P. 104) . . . Steam plant produces fresh water from the sea (P. 131) . . . Refinery Construction Index (P. 101) . . . Cost-imating (P. 134) . . . Equipment Design and Operation (P. 135) . . . The Refiner's Notebook (P. 137) . . . and Field Processing (P. 139).

Higher Pay Demanded

New federation of independent oil unions urges members to ask for 10 per cent increases in current negotiations

OKLAHOMA CITY.—The year-old Federation of Independent Oil Unions is trying to put some extra backbone in its local unions' demands for wage increases.

The governing board of the new organization has voted to request "not less than a 10 per cent increase in wages, with a minimum increase of 25 cents per hour."

In addition, the fledgling federation will press for:

. . . **More fringe benefits,** especially in regard to retirement, vacations and holidays.

. . . **Membership of 100,000** in the near future.

. . . **Greater affiliation** of independent unions in the East.

. . . **Establishment of an executive office,** with an executive secretary.

Leo Martin of the Independent Oil Workers Union of Oklahoma (Continental Oil Co.), Ponca City, who is secretary-treasurer of the federation, said wage negotiations are now under way between several independent unions and the respective oil firms.

Negotiating for wage increases of 10 per cent or more are Central States Petroleum Union (Standard of Indiana), Baytown Employes Federation (Humble Oil), Independent Industrial Workers Association (Esso), Stanolind Employes Bargaining Agency, Stanolind Employes Federation, and several groups of Esso employes in the East.

Independent Petroleum Workers of America (Standard of Indiana at Whiting) will negotiate for a wage increase of 10 per cent or more when their contract expires early in 1957.

Negotiations are now under way between the Independent Oil Workers Union of Oklahoma and Continental Oil Co. at Ponca City, for a wage increase of 15 per cent, with a minimum of 37½ cents per hour.

Martin said the new organization will hold its next meeting in Washington, in an attempt to encourage strong independent oil unions in the East to affiliate.

When the Washington meeting will take place, he said, "will depend on the reactions of oil companies toward requests for wage increases."

Defense through attack . . . The federation was founded last winter, when a group of 11 independent unions representing about 60,000 workers, met in Baton Rouge to keep from being swallowed up by the big Oil, Chemical and Atomic Workers Union *(The Oil and Gas Journal, February 6, page 57).*

The new alliance was motivated in part by the O.C.A.W.'s systematic attempt to move into plants occupied by independent unions. The O.C.A.W. is now the largest in the petroleum industry.

Membership goal for the federation at Baton Rouge was set at 400,000, which would far outnumber O.C.A.W. However, after nearly a year, the new group — with 30,000 members — is a long shot from its original target.

The Baton Rouge meeting was followed up last August 8-11 by a constitutional convention in Chicago. The federation elected Elmo Rogers of Ethyl Corp., Baton Rouge, as president; A. E. Oliphint, Baytown, Tex., vice president, and Martin, secretary-treasurer.

A drawing card for the new group is its dues—10 cents per month, compared with about $1.50 required by O.C.A.W.

Who is involved . . . Federation affiliates are mostly in the Mid-West, the South, and the Southwest. The largest single union member is Central States Petroleum Union with more than 7,500 members.

Some of the unions are slow in affiliating, Martin says, because "the constitutions of many of the independent unions prevent quick decisions."

He said that eight unions are "definitely" affiliated with the federation, and that 23 groups are "tentatively" affiliated.

Trans-Canada Announces Plans

OTTAWA — Trans-Canada Pipe Lines, Ltd., plans to sell $120 million worth of debentures and common stock to pay for a portion of the $378 million needed to build the 2,250-mile natural-gas line from Alberta to Montreal.

The company filed a statement with the Securities and Exchange Commission in Washington proposing an offer of $80 million in debentures and 4 million shares of stock.

A majority of the securities will be offered in Canada, in units of $100 of subordinated debentures due in 1986, and five shares of common stock.

Since it requires less time to qualify in Canada under statutes governing securities, registration action here will be taken at a later date.

Trans-Canada is committed to raise about $250 million and the Canadian federal Government and the provincial Government of Ontario are investing up to $130 millions in the northern Ontario section of the transcontinental line.

First mortgage bonds . . . Trans-Canada plans to issue up to $144 million of first mortgage, 5¼ per cent pipeline bonds. Trans-Canada's sponsors have already contributed $15 million.

Company officials indicated that plans for financial arrangements were progressing favorably, and securities would more than likely be sold in January.

Meantime, Canada's Board of Transport Commissions was scheduled to meet in Ottawa to act upon request for another time extension for financing the pipeline.

Construction progressing . . . Trans-Canada originally had until November 1 to prove financial ability to complete the line. Early in November the board extended the deadline 1 month.

Construction of the western leg of the line has picked up considerably because of favorable winter-weather conditions. Approximately 250 miles of the line is underground.

FPC Eases Emergency Rules

WASHINGTON.—Federal Power Commission certificate rules have been eased to enable independent gas producers to meet emergency situations.

A new order provides that in the event of an emergency an operator may set up temporary service and continue it pending action on his certificate application. But this can be done only if he has an application on file, the purchaser has been authorized to build facilities to receive the gas, a rate schedule has been filed, and the producer files a statement of his intention to invoke the emergency service conditions.

In cases where imminent danger to life and property might result and where the emergency will not continue for more than 60 days, no certificate is required. Another provision drops certificate requirements for drilling gas or oil wells or for testing or purging new pipeline facilities.

Oil-Field Supply Firms Merge

DALLAS.—Two important oil-industry supply and manufacturing firms, Continental Supply Co. and Emsco Manufacturing Co., will be consolidated into one division of Youngstown Sheet & Tube Co., effective January 1.

Emsco, with headquarters in Los Angeles, is one of the nation's largest manufacturers of drilling equipment. Continental, which headquarters in Dallas, distributes oil-field supplies through 70 outlets in 18 states.

Headquarters for the new company will be in Dallas.

President of Continental-Emsco Co. will be Frederick M. Mayer, Dallas. He has been president of Continental since 1945 and was recently elected a vice president of Youngstown Sheet & Tube.

William T. Powell, Los Angeles, will be executive vice president in charge of manufacturing and engineering. He has been president of Emsco since 1952.

Frank I. Brinegar of Dallas will serve as executive vice president in charge of distribution. He is presently executive vice president of Continental Supply.

W. C. Kinder, D. M. Bailey, and Raleigh Hortenstine, Jr., vice presidents of Emsco and Continental, will continue as such with the new company. Kinder will be in charge of machinery and allied sales.

J. A. Mussler has been named a vice president, and will be in charge of all tubular sales as well as pipeline equipment.

Continental was organized in 1912. In addition to the 70 U.S. stores, it operates seven outlets in Canada and two in Venezuela, with sales representatives in Mexico, South America, Europe, and North Africa.

FREDERICK M. MAYER

F. I. BRINEGAR

W. T. POWELL

Emsco was founded in 1923, with majority ownership acquired by Youngstown in 1938. A wide variety of Emsco drilling and production equipment is distributed by Continental and others. Manufacturing plants are located at Los Angeles, Garland, Tex., and Houston.

Refinery Trend Takes a New Twist

CARRIZO SPRINGS, Tex.—A lot of companies have been shutting down their small refineries since the big race for higher octanes started, but Texas Calgary Co. of Abilene has reversed the procedure. It has built a new one.

The firm has just put a 2,000-bbl. distillation unit on stream here. And officials are not worried about spiraling automobile-engine ratios. The plant is concentrating on jet fuel, which it is selling to an Air Force base at Del Rio.

Texas Calgary is trucking about 1,000 bbl. of crude daily—all it can get—from nearby wells, mostly in Winter Garden field, 10 miles away. When more crude is available, the plant will operate at full capacity. To step up deliveries, a pipeline will be run to Winter Garden. There are currently about 42 wells in the area, with about a dozen wildcats drilling.

Products now coming out of the refinery include gasoline, naphtha, kerosine, diesel fuel, fuel oil, and about 500 bbl. daily of jet fuel. All but the jet fuel is sold to local jobbers.

Texas Calgary, which recently moved to Abilene from New York, merged this year with Petroleum Products & Refining Co., owned by Ray McGlothlin, Sr., and associates. McGlothlin is president of Texas Calgary.

The company owns a small plant at Lodge Grass, Mont., and has production in Montana, New Mexico, and Oklahoma.

Industry BRIEFS

A 36-well drilling program in Kansas, Oklahoma, and Texas will be undertaken by the reorganized Holiday Oil & Gas Corp. of Arkansas City, Kans. The new corporation was formerly a partnership operating as Holiday Oil Co. Expansion program was announced following public issuance of stock through Whitehall Securities of New York.

Occidental Petroleum Corp. has purchased one-half of production from 13 wells, producing more than 1,000 bbl. daily in California's North Dominguez field, from J. K. Wadley of Texarkana, Tex. Occidental associates bought the other half of production. Occidental will be the operator.

The group also bought the McKinley block of leases covering 200 acres of land immediately north of the producing area. They plan to drill the block within 60 days. Occidental's associates are Louis W. Abrons, formerly president of General Realty Co. of New York, and Dr. Armand Hammer, president of United Distillers of America, Inc.

Wilshire Oil Co. of Texas will become a subsidiary of Britalta Petroleums, Ltd., of Canada under a stock-exchange deal approved by stockholders of both firms. Each of 1,000,000 outstanding shares of Wilshire will be exchanged for 1½ shares of Britalta. Wilshire will continue operating in the West Texas and Rocky Mountain areas.

The Louisiana Mineral Board will offer leases December 13 on approximately 17,600 acres of land, most of it underlying inland waters.

Bonuses for the first 5 months of the fiscal year have totaled more than $32,700,000. In preparing the state budget, officials had estimated lease bonuses would total $40,000,000 for the entire year.

Humble Oil & Refining Co. has been granted permission to carry on indefinitely its experimental water flood in the Spraberry zone of Spraberry Trend Area field in West Texas. The Railroad Commission had approved 1-year operating periods twice before. The project was launched in October 1954.

G. N. McDaniel, Borger, Tex., has sold 66 wells on 13 leases in Panhandle field of Hutchinson and Carson counties, Texas, for more than $2,000,000. Purchaser was Cubamm Development Co., Inc., Dallas, which immediately turned over the properties for $2,200,000 to Westonian Oil Corp.

This giant is oil equipment in Pakistan because . . .

Hauler Takes to Open Country

DALLAS.—A radically new type of vehicle will move freight over rough open country in Pakistan for Hunt International Petroleum Co. The electrically driven transporter operates without benefit of highways or railroads.

The machine was purchased by Hunt from R. G. LeTourneau, Inc., Longview, Tex., designer and manufacturer of heavy equipment.

LeTourneau declares the only "roads" required by the giant truck-like carriers are through soft sand, powdery snow, deep mud, or dense underbrush. Even when loaded to full 35-ton capacity they can take wide gullies and steep grades in stride.

R. L. LeTourneau, company vice president, says first production models are being delivered to undeveloped areas of both the Eastern and Western Hemispheres where highways and railroads are not available.

U. S. industries also have expressed interest in the vehicles, he said. They include oil, lumber, and mining companies which operate in areas where road-building often is not immediately feasible.

New design . . . Several design features make the big transporter tick. They are:

. . . A d.c. electric motor geared directly to each wheel, making each wheel an independent drive unit.

. . . A braking system which actually has no parts to wear out or replace.

. . . Large low-pressure, tubeless tires 6 ft. tall and 2½ ft. wide.

. . . Flexible suspension system with an oscillating front axle and walking-beam rear axles.

How it works . . . Feature of the independent wheel drive is this: Should one wheel lose traction, its share of the machine's total horsepower is automatically transferred to other wheels which are taking hold.

The braking system which has no parts is made possible by a feeding-back action of the electric motors in the wheels. When machine travel-speed becomes greater than driving speed of the motor, the motors begin acting as generators and in effect create power to stop themselves. Mechanical brakes are furnished also for use in making emergency stops or when the vehicle is parked.

The transporter is 38 ft. long overall, 13½ ft. high, 12 ft. wide, and has a cargo platform 25 ft. by 12 ft. and 6½ ft. high.

Pacific Northwest Completed

SALT LAKE CITY.—Pacific Northwest Pipeline Corp. has completed its main line from the San Juan basin to the Canadian border.

In addition to the 1,481 miles of its main-line gas system the company has laid 884 miles of laterals and gathering lines. The company reported last week that its 1956 construction program is complete with the exception of a little backfill and cleanup work.

Continued drilling in the San Juan basin has given Pacific Northwest a net ownership of 134 producing wells. An additional 18 wells were in the process of completion or shut in for testing. A subsidiary, Northwest Production Corp., has about 16 gas producers.

Rangely Unit Closer

After hearing, operators see goal reached in 1957

DENVER.—Rangely field, Colorado's largest, will be unitized in 1957—barring unforeseen obstacles.

This was the general feeling last week at the conclusion of a hearing before the Colorado Oil and Gas Commission. The hearing considered a unitization proposal authored by The California Co. As largest operator in the field, the company is scheduled to be the unit operator.

After a 10-year effort to achieve the goal, the situation now "looks encouraging," Commission Director Arthur Jersin said. A fair-participation formula, including capital adjustments, is still the center of negotiations.

"Attempts at unitization," Jersin declared, "have satisfactorily progressed to the point where another continuance of our July order was granted."

This order, also reviewed at the hearing, limited Rangely production to 300 bbl. of crude daily for any well and required reinjection of accompanying gas in excess of 180,000 cu. ft. Jersin said the field's major operators have spent $7,500,000 on new equipment to comply with the reinjection order.

The commission set the next formal hearing on the conservation order for March 5, but directed operators to report by early January on progress toward unitization.

"If their reports don't meet with the commission's approval, a new and more stringent conservation order will be issued immediately," Jersin warned.

Mt. Diablo Absorbs Mascot

BAKERSFIELD.—Mt. Diablo Co. has purchased and is now operating Mascot Oil Co.s 54 wells producing 391 bbl. daily in the Taft area of Kern County. With Mascot's production, Mt. Diablo now has 154 wells producing more than 800 bbl. daily.

Mt. Diablo gave 312,500 shares of its stock for Mascot Oil Co. assets. Mascot will be dissolved. Officers of Mt. Diablo are T. D. Bonney, president; Ross McCollum and J. W. Schmid, vice presidents; E. L. Harbach, treasurer and assistant secretary, and Irma Gregg, secretary.

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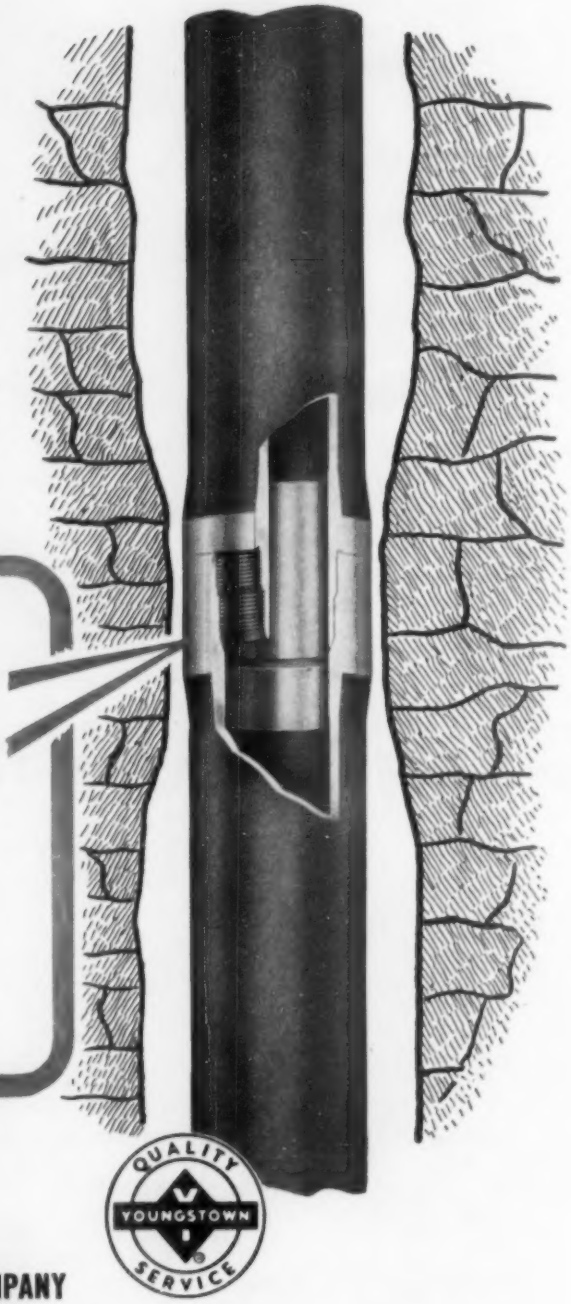
Speedtite is busy on-the-job from off-shore drilling sites to the deepest wells in the Southwestern oil fields. Why not let your Youngstown representative show the many ways this modern casing can increase the efficiency of your operations?



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Union Price Hike Spreads

Increases on heavy crudes being posted by nearly all of California's buyers; some products prices also going up

LOS ANGELES.—All of California's principal crude purchasers by last week had met Union Oil Co.'s recent price increase for heavy crude.

The increases in posted field prices range from 40 cents a barrel for 14°-gravity crude to 1 cent a barrel for 35°-gravity crude. All raises were retroactive to November 19.

Some product prices also followed the heavy crude upward. These included:

. . . **Bunker fuel,** boosted 40 cents a barrel to make the current price at the harbor $2.50 a barrel.

. . . **Diesel, stove oil, and kerosine.** Union raised the price 1 cent per gallon. Standard Oil Co. of California announced only a ½ cent raise for the same products.

. . . **Mid-barrel products prices** as well as those on bunker fuel in the Pacific Northwest. Both Standard and General Petroleum Corp. announced raises of 0.6 of a cent and 45 cents on the respective products.

The upshot . . . With these price adjustments, drilling activity in California's heavy crude fields is expected to pick up substantially.

The new schedule tends to restore better balance to the crude-price structure. It will reduce the spread between lowest prices and highest prices which has existed since 1949. At that time prices of low-gravity crudes were cut severely because of a huge oversupply, but the prices for light crudes were unchanged.

Prior to that time the highest posting for 14°-gravity crude was $2.18 per barrel posted December 27, 1947. After numerous cuts the high price for this type crude became $1.28 on September 2, 1949. Advances prior to last month brought the price back to $2.13. Thus the current highest posting of $2.53 per barrel for 14°-gravity crude is $1.25 higher than the 1949 posting.

Highest posting for 36°-gravity crude, unaffected by the recent raise, is now $3.37. This compares with $2.84 in 1949, or 53 cents more.

Adequate stocks . . . The price increase followed a substantial gain in stocks.

According to 9-month Bureau of Mines figures, total stocks were up 9,374,000 bbl. at the close of September. This contrasted to a 20,400,000 bbl. drop during the same period of 1955.

Foreign crude imports were 173,000 bbl. daily during this period, or 86,000 bbl. daily above the same 1955 period. The price increase is not expected materially to affect imports, however, since it concerned the lower gravities.

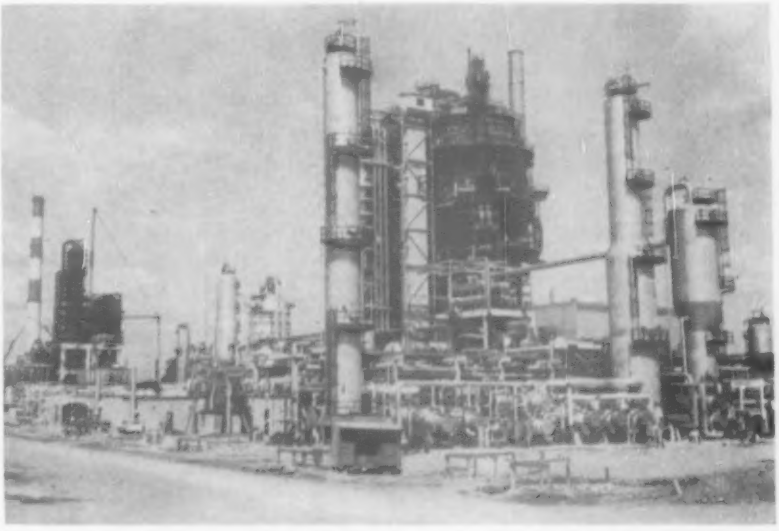
Most of the difference in stock changes for the corresponding periods of 1955 and 1956 can be accounted for by inventory shifts in crude, residual fuel, and cracking stocks.

Residual fuel increased 3,881,000 bbl. during the first 9 months of this year compared with a reduction of 14,460,000 bbl. for the same period last year. Crude gained 1,758,000 bbl. this year in contrast with the drop of 3,580,000 bbl. during the first 9 months of 1955. Cracking stocks changed very little for the first 3 quarters of this year, but dropped almost 6,000,000 bbl. for the same period in 1955.

Most of the reversed trend in residual stocks can be explained by shifts in movement outside District 5.

Shipments of residual to the East Coast amounted to 10,908,000 bbl. for the first 9 months of 1955, but dropped to 182,000 bbl. for the same period this year. Exports to Atlantic foreign countries totaled 3,768,000 bbl. for the 1955 period with none reported so far this year. Pacific foreign shipments of residual also decreased—from 13,876,000 bbl. for the first 9 months of 1955 to 8,548,000 bbl. this year.

Total offshore movement of heavy fuel from California this year has been 19,822,000 bbl. less than for the same period in 1955.



Tidewater Units Go On Stream

DELAWARE CITY, Del.—Four of eleven major units scheduled for Tidewater Oil Co.'s 130,000-bbl. refinery are on stream.

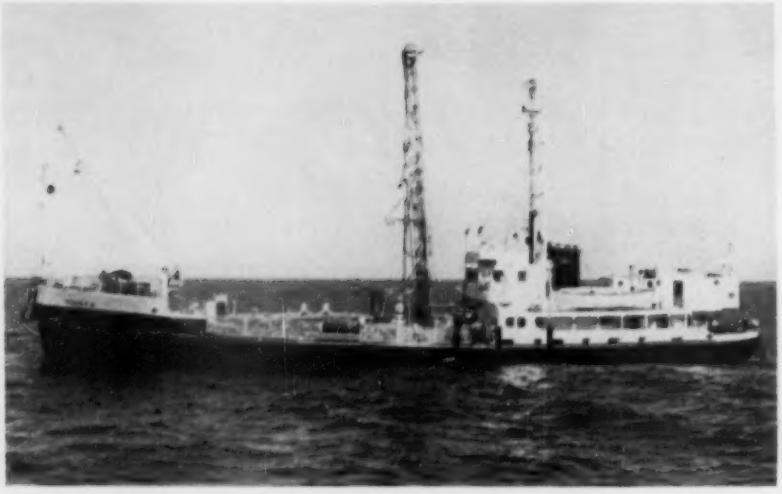
Two of the on-stream units are shown above. The world's largest fluid catalytic cracker is shown directly behind the gas-recovery system, in the foreground. A polymerization unit and the world's largest crude-distillation unit are also in operation.

At the extreme left is the fluid coker, expected to go on stream early next year and second from left is the crude unit, which has been up to 100,000 bbl. daily, but has been cut back to a lower rate. Tidewater brought the crude unit and Orthoflow cracker down to smooth out minor "bugs."

The record-cracking cracker, with a 250-ft. converter column and 275-ft. stack, has a capacity of 102,000 bbl. daily. A total of 14,000 hp. is used to drive 11,500,000 cu. ft. of air per hour to the regenerator.

Other units yet to go into operation are the cat reformer, Udex extraction, hydrogen treating, alkylation, sulfur recovery, and hydrogen manufacturing. The entire refinery should be in regular operation by early next year.

Tidewater started stocking crude last August and is believed to have enough on hand to keep the plant on schedule during the next several weeks while the other units are brought on stream. Most of the streams from operating units are now going into storage.



California Drilling Fleet Expanding

LOS ANGELES.—The buildup of California's oil-hunting fleet is continuing.

The latest addition is this coring ship, launched recently by General Petroleum Corp. It's the first self-propelled unit equipped for midship drilling to see service in California.

Other newcomers to the area are towed drilling barges owned by Humble Oil & Refining Co. and The Texas Co. Later this month, the West Coast's first drilling platform, a DeLong-type barge, will start work off Huntington Beach.

The No. 1 Pacific Driller will be used by Monterey Oil Co., Humble Oil & Refining Co., and Seaboard Oil Co. to explore a 1,280-acre lease which starts a mile offshore and underlies 45 to 70 ft. of water. Drilling crews will be supplied by Sun Marine Drilling Corp., an affiliate of San Joaquin Drilling Co.

Richfield Oil Corp. now has two barges at work off California. Standard Oil Co. (Calif.), Union Oil Co., and Western Gulf Oil Co. each has one barge in operation. All are operated under contract by Submarex, Inc., of Santa Barbara, which also has a small core barge of its own at work.

Hagen deals include Toklan and . . .

New U.S.-Venezuelan Company

HOUSTON.—Cecil V. Hagen, independent operator, has formed a new firm to take over U. S. and Venezuelan properties now held by five other groups.

The newly organized Kirby VenSyn Petroleum Co. plans to acquire nearly 2,000 bbl. of daily production and varying interests in more than 2,000,000 acres in the two countries. Deal also includes 76,000 acres in Venezuelan concessions.

In another transaction, Hagen acquired 40 per cent ownership of Toklan Oil Corp. of Tulsa, by purchasing all Toklan shares owned by Venezuela Syndicate, Inc.

New company . . . Hagen said the new Kirby VenSyn Petroleum Co. plans to acquire assets of Venezuela Syndicate, Inc., and Kirby Oil & Gas Co.; most of the assets of Murchison Trusts, and George J. Greer, trustee; and certain properties of Montax Exploration Co.

The transaction, subject to certain stockholders' approval, would involve transfer of 2,728,754 shares of stock.

George Sawtelle, president of Kirby Oil, is expected to become chairman and chief executive officer of the new organization, and Jeff Montgomery, associated with the Murchison interests, is expected to be named president.

Toklan deal . . . A. F. Childers, Jr., Tulsa, formerly executive vice president, is the new president of Toklan, replacing Roy B. Kelly of Washington.

Toklan and Gulf Coast Leaseholds, Inc., Houston, jointly own net production of 2,200 bbl. per day in six states. Hagen is president of Gulf Coast as well as Venezuela Syndicate, Inc.

FPC Ruling Awaited

Decision is expected soon on Texas-Florida gas line

WASHINGTON.—Decision on the proposed $148 million Texas-to-Florida gas line may be reached by the Federal Power Commission before the end of the year.

A number of contracts, on which the project depends for gas supply, are conditioned on issuance of a certificate by December 31.

The project calls for the building of a $53-million line from Southwest Texas to Baton Rouge by Coastal Transmission Corp., and a $95-million line from that point to a number of Florida cities by Houston Texas Gas & Oil Corp. The line would go as far south as Miami.

Under the normal FPC procedure, which calls for the filing of briefs and replies after hearings and then the writing of a report by the examiner, the case could not be decided for some weeks.

Racing against time, the applicants have filed a motion to omit the examiner's decision and to send the matter direct to the full commission for quick action. Hearings started last July 9.

Both lines would be 24-in. and the 1,527-mile system would have an initial capacity of 250 million cubic feet daily, later to be expanded to 350 million cubic feet as additional gas supplies are secured.

Gas Loss Won't Stop Line

WASHINGTON.—American Louisiana Pipe Line Co. is going ahead with its big gas-line expansion program despite the outcome of its tiff with Gulf Refining Co. over supply contracts.

Gulf last month cancelled contracts covering 80 to 90 per cent of the 100,000,000 cu. ft. of gas daily it had agreed to supply. Gulf said time had run out for American Louisiana to secure certificates from the Federal Power Commission.

American Louisiana charged that Gulf could not withdraw the contracts after FPC hearings on the project had already started. FPC suspended the hearings and took the question under advisement.

Now, American Louisiana reveals it has bought 180 billion cubic feet of gas reserves to replace the loss. About 70 billion feet of this, the company said, would be immediately connected to its line. These reserves would provide about 25 million cubic feet daily. They are new discoveries located in North Holly Beach and Second Bayou fields in Cameron Parish, Louisiana.

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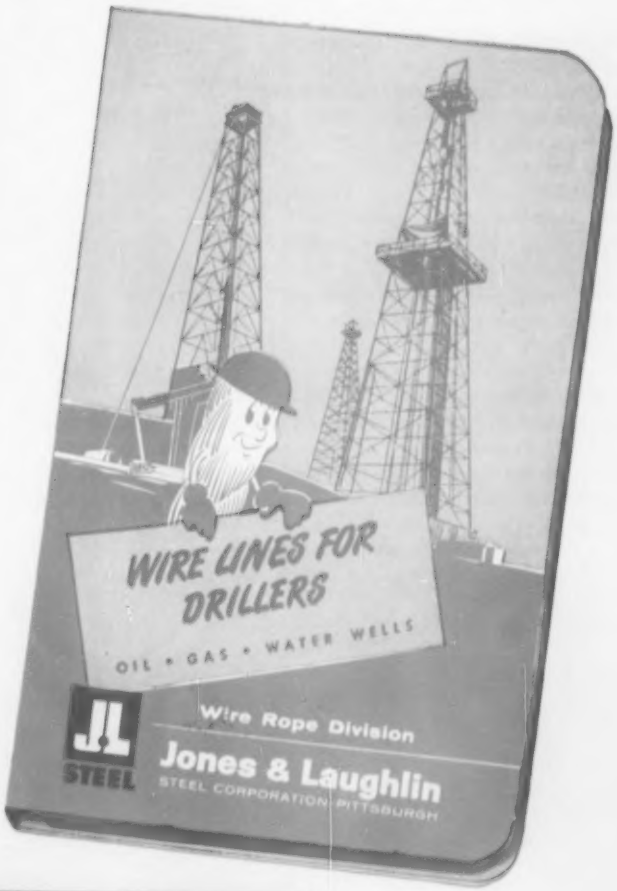
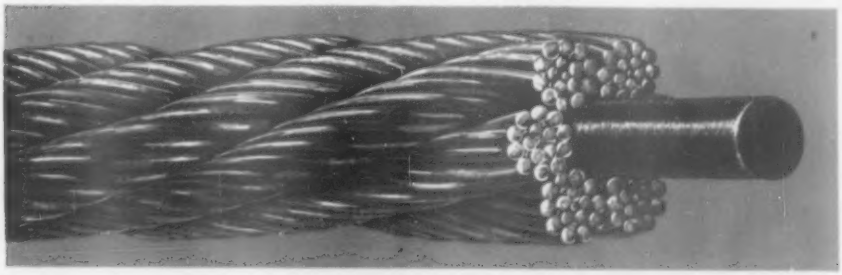
THE PLASTIC CORE . . . has more uniform diameter. Retains resiliency, gives cushion-like, firm, uniform support for outer steel strands throughout the complete length of the rope.

THE PLASTIC CORE . . . has joints which are fused under heat, resulting in a connection that gives a permanent, continuous, uniform center in which no splice failure is possible.





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by D. E. COOPER

Ethyl Corporation, Detroit, Mich.

The distribution of fuel components and fuel additives to the cylinders of multicylinder engines is of prime importance to the petroleum industry. Just as a chain is only as strong as its weakest link, so is an engine's performance limited by the one cylinder which does not continuously get its proper dosage of high-octane hydrocarbons or of tetraethyllead.

The goal of engine designers is the creation of an engine wherein the fuel/air ratio, hydrocarbon composition and additive concentrations are identical for each cylinder of a multicylinder engine. Fuel injection—now becoming commercially available—represents one approach to the solution of this difficult problem.

Whether fuel injection or carburetion is employed, however, an accurate knowledge of fuel and additive distribution in engines is necessary to assure optimum use of the gasolines the refiner is producing today.

A continuing study

As is the case with most of Ethyl's other basic research studies, the study of fuel distribution has been a continuing one. Some years ago, a glass manifold was installed on an engine and motion pictures were made of flow patterns, giving some insight into the quantities of fuel mixture fed to various cylinders.

A second step in Ethyl fuel distribution studies involved the tagging of specific hydrocarbons with deuterium or heavy hydrogen. One component (the cyclopentanes, for example) had a specific number of hydrogen atoms replaced with heavy hydrogen. This special fuel was then burned in the engine. Samples of the exhaust gases from various cylinders were condensed and analyzed in a mass spectrometer to give a picture of the distribution of that particular

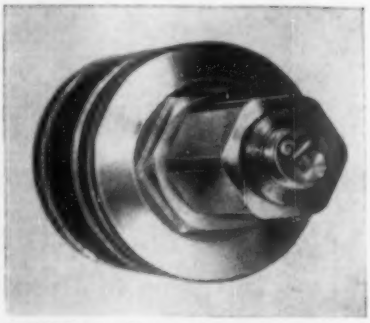

FIGURE 1. Nose view of combined sampling valve and spark plug.

FIGURE 2. Test engine in the laboratory and gas sampling and collecting system.

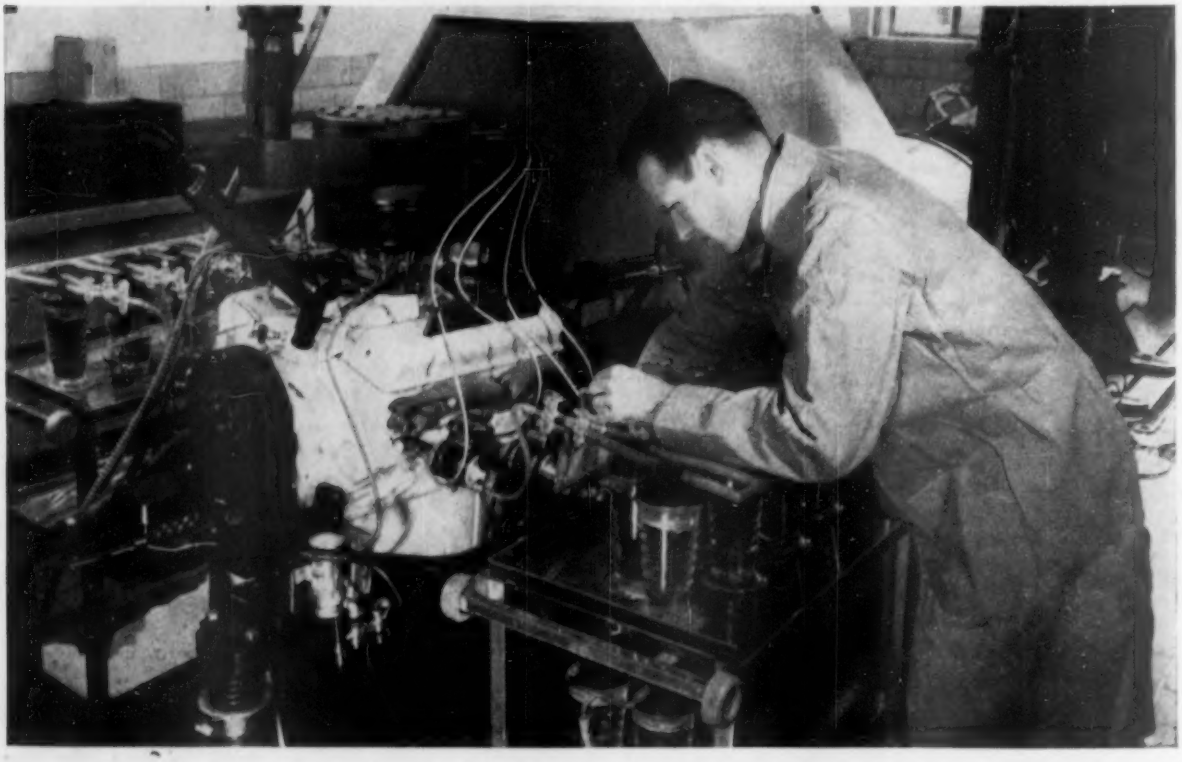

FIGURE 3. Scintillation counter setup at Ethyl Research Laboratories for examining tritium-containing condensate samples.

hydrocarbon among the cylinders of the engine on test. This technique required, however, that the ratio of heavy hydrogen to normal hydrogen be at least 1 to 100 and thus ruled out studies of additive concentrations, which are much smaller.

Tagged carbon atoms

A third step in this continuing program of fuel distribution studies has involved switching from a stable isotope such as deuterium to a radioactive one such as carbon-14. Now it becomes possible to tag tetraethyllead with carbon-14 and measure its concentration in an engine cylinder accurately, even though only one tagged atom is present among 100,000,000 normal carbon-12 atoms!

All of these distribution studies involved the use of a quick-opening (1 1,000 second) sampling valve. This valve samples the contents of a particular cylinder. It is screwed into the spark-plug opening and combines the sampling valve with spark-plug electrodes. Figure 1 shows a nose view of this combined sampling valve and spark plug.

Figure 2 shows the test engine in the laboratory and the gas sampling and collecting system. The gas samples are bubbled through absorbing solutions of barium hydroxide. The carbon dioxide is regenerated and transferred to an ionization chamber, where its beta activity is measured by a vibrating-reed electrometer.

And now . . . tritium

The newest refinement in this study consists of the replacement of carbon-14 with hydrogen-3 or tritium as the radioactive tracer element. The use of tritium simplifies and makes less expensive the preparation of tagged hydrocarbon or additive molecules for study. It also simplifies the exhaust-gas-sample collection technique. The scintillation counter used for studying the tritium-containing condensate samples from the cylinders is shown in Figure 3.

As is the case with all of our basic research studies, the information from this continuing study of fuel distribution is available to the petroleum industry. We would be happy to discuss any particular aspect of this problem with you in your office. We would also be happy to have you visit our Detroit Laboratories to see this equipment and discuss it with our technical personnel. In either case, contact your local Ethyl representative for an appointment.

What Ethyl Research offers you

Ethyl Research is in the unique position of serving both the petroleum and automotive industries.

In that capacity, we have contributed much in the field of fundamental as well as applied research. Today at our laboratories in Detroit we are conducting studies on the distribution of fuel components and fuel additives to the cylinders of multicylinder engines.

Searching for answers to these basic problems has led us to develop many new instruments and new techniques. The information which we have developed from our research efforts is being constantly circulated throughout both the automotive and petroleum industries to help them with their research.

If you desire any information concerning fuel-engine problems, just contact your Ethyl representative.

ETHYL

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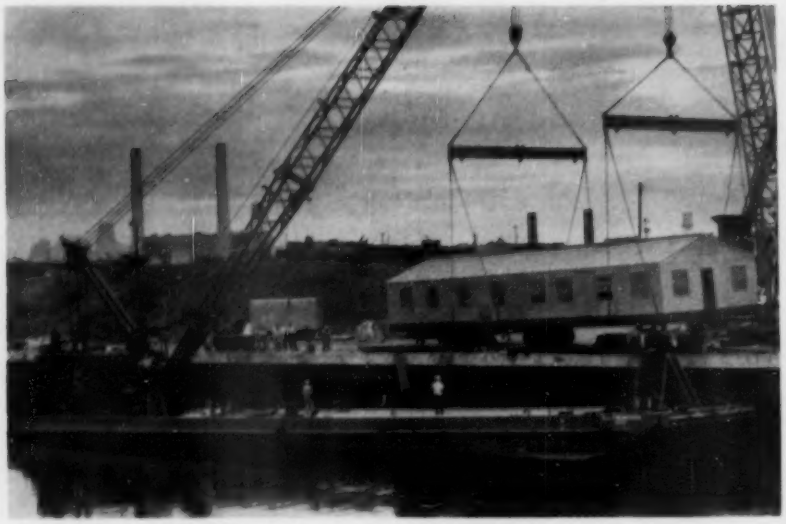
New York 17, N. Y.



"Dipper" to Dredge Louisiana Canals

HOUSTON.—This new dipper dredge barge, built for Brown & Root, Inc., at a cost of $350,000, soon will go to work in coastal oil fields of Louisiana.

Equipped with a 100-ton capacity crane and a 120-ft. boom, the barge will be used to dredge canals for rig locations and pipelines. Without the 6-cu.-yd. clamshell bucket, the crane can be used for miscellaneous lifting operations. The vessel, shown being outfitted with crew quarters at Brown & Root's Houston docks, is 130 ft. long and 38 ft. wide. It is one of two barges built in the Great Lakes area for Brown & Root and towed to Houston down the Mississippi River and through the Intercoastal Canal.

Shale Reactivation Sought

DENVER.—Colorado's congressional delegation will ask the next session of Congress to reactivate the oil-shale research plant at Rifle in western Colorado, with the Navy doing the work.

"It is my thinking that the executive department made a great mistake in closing the Rifle plant," said U. S. Rep. Wayne N. Aspinall. His views are shared by Sen. Gordon Allott and Sen-elect John A. Carroll.

The legislators said they will seek reactivation of the plant because of the Middle East crisis, and because of the failure of private industry—with one exception—to go forward with oil-shale experiments.

Operations at the Rifle plant were halted last June when, after 8 years of research, Congress refused to make any appropriations for its continued operation.

Union's experiment . . . Union Oil Co. of California, at the same time, began construction of a plant at nearby Grand Valley to find out if shale oil can be produced at a cost low enough to compete with petroleum *(The Oil and Gas Journal, November 12, page 139)*. Its shale mine and crusher system are already operating. A retort with a capacity in excess of 300 tons a day soon will be finished.

If successful, the experiment would pave the way for development of a vast body of oil shale in the Piceance Creek basin, where reserves are believed sufficient to produce about 900 billion barrels of oil.

Aspinall said that as soon as Congress reconvenes in January, he will go before the Committee on Armed Services to ask that the Navy be authorized to continue work at the experimental station.

No immediate results . . . But even if Congress appropriates the funds this coming year, it probably would take a year—if not more—to assemble and train the 200 workers required to operate the Rifle plant.

Specially trained miners, engineers, retorters, and refinery workers were discharged or transferred before the experiment station was closed.

Reactivation of the Rifle plant and success of the Union Oil Co. effort would have no effect on the present crisis, but could be of long-range significance.

Wage Vote Slated

Humble refinery employes consider pay-raise offer

BAYTOWN, Tex. — Small wage increases for about 13 per cent of the hourly-paid employes of Humble Oil & Refining Co.'s Baytown refinery are provided in a proposed 2-year contract awaiting union approval.

The Baytown Employes Federation, independent union representing some 4,500 Humble workers, is scheduled to vote on the contract by December 4. The old contract expired last March, and the union recently authorized a strike vote.

Among provisions of the new contract is a proposal which would set minimum pay at the average scale in nearby refineries. The three highest-paying refineries among the six largest in the Harris County, Texas City, and Sabine areas would be used in determining the minimum scale at the Baytown plant.

A union spokesman estimated this provision would bring pay increases totaling about $25,000 per year for some 600 employes.

In addition to specific pay hikes proposed in the new agreement, the union is seeking a general increase of 10 per cent or 25 cents per hour (see related story on page 72). A union official said negotiations on this point will continue.

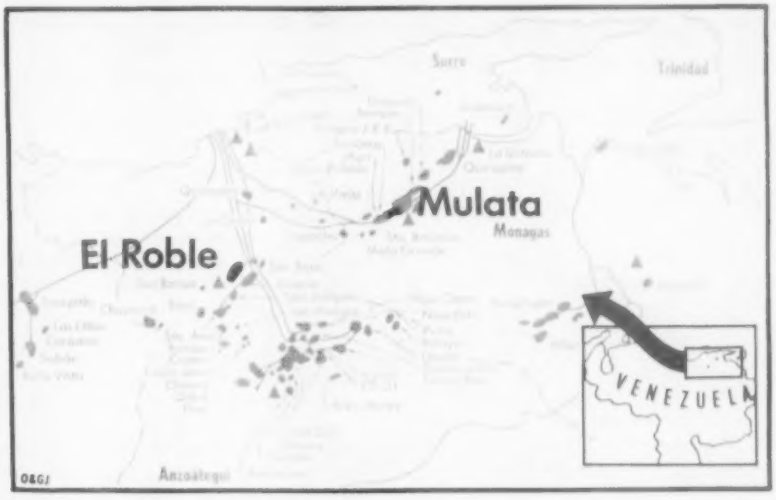
The National Labor Relations Board, through its regional director, refused to file a complaint against Humble for its conduct during the bargaining period. The union had filed a charge of unfair labor practice against the company last August.

Rangeland Line Approved

EDMONTON. — Rangeland Pipe Line Co. has received provincial approval to build a crude line between the Sundre and Sylvan Lake-Bentley producing areas of south-central Alberta.

Rangeland, a subsidiary of Hudson's Bay Oil & Gas, Ltd., will build 46½ miles of 12-in. from the Sundre area north to existing facilities continuing to Edmonton *(The Oil and Gas Journal, October 15, page 99)*. Four-inch gathering lines will be laid as needed.

The project was opposed before the Alberta Petroleum and Natural Gas Conservation Board by Pembina Pipe Line, Ltd., and Cremona Pipe Lines, Ltd. Pembina had an alternate plan for a line north and Cremona, operator of a line from the Sundre-Westward Ho-Harmattan area to Calgary, feared its supply was threatened.



Phillips Widens Holdings

Pantepec sells its concessions in Western Venezuela's Mulata and El Roble fields for cash and profit share

PHILLIPS PETROLEUM CO. has acquired the concessions in Western Venezuela of Pantepec Oil Co., C.A. and already has taken over operations.

The concessions consist of about 32,500 acres currently producing about 5,575 bbl. daily of crude oil from about 150 wells, 48 of which are shut in. The properties are in the Mulata and El Roble fields and are close to other Phillips production and gas-processing facilities.

The purchase will enable Phillips to take immediate steps to increase its production by opening up previously shut-in Pantepec wells. In addition, Phillips acquired Pantepec's one-half interest in a natural-gasoline and crude-stabilization plant in Mulata field.

The deal . . . Phillips will pay Pantepec $4,900,000 cash in five installments.

The first installment of $1,400,000 will be due January 2, 1957; another of $2 million on January 2, 1958; and three others of $500,000 each on July 1 for the next 3 years.

Pantepec will get additional oil payments totaling $5,610,517 from 10 per cent of production. It also has reserved 40 per cent net profit interest and later a 60 per cent interest in production from El Roble's Merecure formation and the Amarillo "C" and "D" reservoirs and a 50 per cent net profit interest in new production from Mulata. Phillips will pay the total cost of the deep-zone drilling.

Phillips also agreed to start producing gas from the Merecure formation which had been ordered shut in by the government because of high gas-oil ratios of wells. Pantepec had no facilities to conserve the gas. Phillips also will drill at least one and maybe two deep wells in the Mulata field designed to test horizons below the lower Textularia formation.

Pantepec at the first of the year carried its investment in Venezuela at nearly $33 million. It broke down like this: $917,864 for the concessions on 32,564 acres; $9,435,371 for wells in Mulata field; $1,436,521 for gathering and artificial-lift facilities in Mulata field; $3,922,835 for gas-adsorption and stabilization plants; $476,314 for camps and other facilities; $15,674,401 for El Roble field wells; $658,282 for El Roble gathering and artificial-lift facilities; $876,343 for camps in El Roble; and $475,023 for other Venezuelan equipment.

Big indebtedness . . . The deal in effect bails Pantepec out of extreme financial difficulties.

A Pantepec spokesman said the cash payments from Phillips will be available to discharge the company's obligations. These debts include $6,420,732 in production taxes owed the Venezuelan Government and $2,765,000 on a court judgment obtained by Cie. Francaise des Petroles.

The French firm obtained the judgment last February in New York Supreme Court for $3 million plus 6 per cent interest from October 1951 on grounds Pantepec failed to fulfil a contract. The agreement was for Pantepec to drill 50 Mulata and 25 El Roble wells under which C.F.P. had option to acquire half interest.

Several months ago, Union Oil Co. of California was reported negotiating for the Pantepec properties in Venezuela but later decided to drop the deal.

Pantepec affiliates have extensive exploration concessions in the Philippines and Israel.

Phillips has Venezuelan production averaging 8,100 net bbl. daily. It also has a wax plant, natural-gasoline plant, and repressuring facilities in San Roque field.

Cuba To Be Mapped

Aerial survey of island to help oil exploration

THE entire island of Cuba soon will be mapped in complete detail from the air.

Aero Service Corp., Philadelphia, signed a formal contract with the Cuban Government last week. The mapping firm will start the step-by-step aerial survey this month.

The project will cost $1,100,000 and require 2 years to complete. The maps are expected to give a tremendous assist in Cuba's oil exploration. The surveys will define concession areas and provide boundary control for well locations, seismic surveys, and other oil exploration activities. They also will be used in developing Cuba's other mineral resources.

First of its kind . . . When the project is completed, Cuba will be the first nation to have complete aerial photo map coverage for all of its land.

In contrast to the 2 years required for the aerial photography, ground surveys of Cuba would have taken an estimated 40 years.

The aerial mapping will be projected to a final scale of 1 to 50,000, with 10-meter contours. Altogether 324 separate maps will be made to cover the entire country. Under its contract, Aero Service will furnish nearly 5,000 copies of the maps in 1,660,000 sections.

Inland Areas Tapped for Emergency Oil

- **Buyers continue pouring oil through gulf ports in ever increasing volume to supply Europe in Middle East crisis**
- **Wood River also gains importance; crude piped there from Rockies, Mid-Continent is being barged down river**

UNUSUAL oil-buying deals cropped up last week in America's oil country as the industry continued to fill the vacuum caused by stoppage of Middle East crude.

While world diplomats strived to keep an uneasy peace in the tense Suez Canal region and officials in the western world struggled to buy and transport replacement oil, this was the picture in the U. S. oil-producing country:

. . . Oil shipments from Gulf Coast ports have risen so high they will average 400,000 bbl. daily above normal for November. The week before the estimate was 330,000 bbl. daily extra, and 2 weeks previous it was 170,000 bbl.

This spurt is remarkable when you consider it didn't start until mid-November. It shows how fast the industry has moved to rearrange ship schedules. One result is that storage on the Gulf Coast is reportedly nearly cleaned out and pipelines moving into that area are full.

. . . Pipeline movements to the gulf from West Texas and New Mexico are beginning even to exceed previously rated capacity.

Before the Suez crisis there was a reported 75,000-bbl. daily empty capacity in the lines. But this was immediately filled. Since, it has been exceeded by 25,000 bbl. daily. The explanation is tighter scheduling and installation of additional booster power.

Strange situations are beginning to develop. Some buyers report that even the busy pipelines are not able to handle all the allowable production in West Texas. Another buyer says he is unable to buy any West Texas crude even though he has a way to get it to port. One firm is reported moving some West Texas crude northeast into southern Oklahoma and then over pipeline connections south through Texas to the gulf.

. . . Wood River, Ill., area is gaining new importance as a buying and shipping center. Pipelines connect this area from the southwest and west. From here oil is barged to the gulf down the Mississippi River.

Some industry economists estimate there is 28,000,000 to 30,000,000 bbl. of crude available in storage in the general Mid-Continent area and Wyoming. This is the area where oil could be drained into the Mississippi and barged to tidewater.

This vast storage, plus production in the Rockies, already is being tapped. Standard Oil Co. (Ind.), through its subsidiary, Stanolind Oil & Gas Co., has sold slightly under 5,000,000 bbl. at Wood River in the last 2 weeks either for export or to replace imports. Much of the crude is Wyoming black and medium gravity and will be barged down river.

Standard Oil Co. (N.J.), has picked up Elk basin crude at Wood River through the Platte Pipeline from its subsidiary, Carter Oil Co., for the accounts of European affiliates. Buyers report even after paying 4-cent loading costs and 40-cent barge tolls the Elk basin crude delivers to tankers cheaper than Mid-Continent sweet crude.

. . . Heavy, sour crudes—often a drug on the American market—are coming into demand.

European refiners are geared to charging the medium gravities and can handle high-sulfur oils. This gives credence to reports that considerable southern Oklahoma sour is being sold at Wood River. This, along with the low-priced, medium-gravity oil from the Rockies may bypass much Mid-Continent sweet and wind up in Europe.

However, the demand for Mid-Continent sweet crude is reported picking up but not as rapidly as the heavier oils.

. . . Markets continue tightening up for heavy fuel oil and distillates. If prices firm much more, some refiners report they may shift yields to more distillates and less gasoline, which is in oversupply.

Gulf Coast refiners already are trying to make "package deals" requiring exporters to buy gasoline to get fuel oil. The catch is they have mostly premium gasoline which Europe doesn't want. Only one such deal has been made so far. Petrofina has taken one tanker of gasoline to Canada and one tanker of distillate to Belgium in order to get the residual fuel it wanted.

Competition . . . First signs that Russia may try to make capital of the European oil shortage appeared last week.

Diplomatic sources in this country heard the Soviets have made offers to France, Egypt, and Syria. They reportedly offered France about 4,500,000 bbl. of oil over an unspecified delivery

DYNAMITED CRUDE PIPELINE is surveyed by oil company officials and newsman near Irbid City, Jordan. The photograph is one of the first to come out of the Middle East showing damaged pipelines. This particular carrier is the old Iraq Petroleum Co. line to Haifa which has not been in normal use for a number of years. It was dynamited after I.P.C.'s line to Lebanon was blasted at three points in Syria.

period. French refineries have been processing an average of about 5,000 bbl. daily of Russian oil in recent months

There apparently was no similar offer to the United Kingdom but the British have not been importing Russian oil in the past.

Washington officials discounted reports of the Russian oil offers as a propaganda effort. They pointed out Russia already is exporting three to four million tons of oil a year to Western Europe and cannot increase the amount very much. Besides most of the oil was moved by western tankers which now will be needed on other runs.

What about U.S. help . . . Talk in Washington revolved around several possible plans of action, but nothing yet has jelled.

One report indicated the State Department is working on a plan designed for U.S. suppliers to take over the task of shipping oil to Continental Europe. Britain would be allowed to concentrate on furnishing her own oil by Persian Gulf tanker shipments.

Such a plan, it is conceded, would be unpalatable to British commercial interests. But it would be more economical to the U.S. suppliers.

Britain re-exports almost 150,000 bbl. daily in products of the total 830,000 bbl. daily of crude and products which she imports. Thus the reasoning goes: If the United Kingdom could concentrate her available tankers to supplying herself, Continental Europe could be supplied in part with Saudi Arabian crude moved through Tapline and lifted at Sidon by U.S. tankers.

Sen. Lyndon Johnson, Democratic majority leader in the U.S. Senate, hinted last week that the U.S. is preparing a $600 million oil-aid program for Europe. The Texas senator gave no details, however, and indicated there would be no further word until after a December 14 meeting of President Eisenhower and congressional leaders.

Another proposal being talked is a "Marshall Plan" on oil using the machinery of the Organization for European Economic Cooperation. The oil supplies would be furnished on a cash basis as long as Europe's dollars hold out. Loans and possibly grants would be made available after that.

But the official U.S. position still appears unchanged. It can be boiled down to this: Western Europe can get along on an austerity basis for the time being on oil supplies hauled around the Cape of Good Hope and those being shipped from the Western Hemisphere on a strictly commercial basis. *

Officials hope that by mid-December relief plans may get rolling. They also hope by then that British and French military forces will be out of the Suez area. This would save the U.S. embarrassment with the Arab nations.

Plans now call for the Middle East Emergency Committee to step up the flow of oil from this country by coordinating tanker movements and pipeline runs. The O.E.E.C. would handle the European phase of the operations. Financial help would come through outright grants or loans from the World Bank.

Costly adventure . . . The total cost of the Franco-British expedition into Egypt may never be known. But indications that it will be tremendous included these:

. . . Hints that $500 to $600 million may be put out by the U.S. to help Europe finance dollar oil.

. . . $40 million to clear the Suez Canal, plus the cost of ships sunk to block it.

. . . Millions more to be spent in maintaining United Nations troops in Egypt, in added world shipping costs over uneconomic routes, in slowed down European industrial activity, in lost oil-royalty payments to Arabian producing countries.

Arab flow a trickle . . . The loss to Middle East oil-producing countries was emphasized again by developments there last week:

. . . Kuwait, biggest single supplier of crude to Europe, cut its production to 25 per cent of normal.

Production there has averaged 1,171,000 bbl. daily during 1956 so far, but last week it was only 250,000 bbl. daily because of a lack of tankers.

The first tanker to leave Europe since the Suez blockade was due from around the Cape of Good Hope late last week. Tankers are expected to be loading at the rate of four or five a day by the end of December and at the normal rate of eight tankers daily soon afterward.

. . . Iran cut back its production 25 per cent in much the same ratio as a reduction put into effect earlier by Saudi Arabia. Iranian production hit a new record in October of 634,000 bbl. daily.

Concession Granted by Panama

A 500,000-ACRE concession in the Republic of Panama has been granted to two U. S. independent operators.

E. Raymond Moss of North Miami Beach, Fla., and William S. Edgemon of Cincinnati acquired the acreage in the Province of Veraguas, about midway between Panama City and the Costa Rican border.

They are shown with Panama President Ernest LaGuardia, Jr. Pictured from left are President LaGuardia; Moss; Edgemon; Roberto Lopez Fabrega; minister of public works, and Varley P. Young.

Development plans have not been announced, but Dr. Howard A. Meyerhoff of Washington, D. C., is in Panama conducting preliminary geological investigations on the concession.

Moss and Edgemon have developed extensive lands in South Florida. They have established their base at Santiago.

Free-World Crude Off

Areas outside U. S. top 8 million barrels daily for new high in September, but production at home shows decline

FREE-WORLD producing areas outside the United States passed the 8-million-barrel daily mark in September—and they made the last million barrels in just one year.

The 8,007,900-bbl. daily average was up 1,005,500 bbl. from September 1955, a gain of 14.3 per cent in one year, or an average increase of 83,800 bbl. daily per month.

Despite a new record outside the U.S., a decline in domestic production caused a total free-world drop from August 98,700 bbl. daily to 15,061,900 bbl. daily. The U.S. averaged 7,054,000 bbl. daily, off 141,000 bbl.

The record high in the rest of the free world was due to a net gain of 42,300 bbl. daily, with Venezuela and the Middle East accounting for most of the gains.

Venezuela produced 2,493,000 bbl. daily, a gain of 27,500 bbl. daily over the preceding month. The increase raised the country's 9-month average to 2,399,600 bbl. daily, up 275,500, or 13 per cent, over the same period last year. September also was the fourth record month in a row.

The Middle East's all-time high of 3,716,600 bbl. daily was the result of a gain of 30,800 bbl. daily. Three of the major producers increased output and one declined.

The picture on a barrels-daily basis was:

... **Saudi Arabian output** gained 42,000 bbl. over August to 1,047,900 bbl. This raised the kingdom's 9-month average to 1,041,000 bbl, up 95,700 bbl. or 10.1 per cent over last year. On a January-September basis, the country showed a better increase than any other Persian Gulf producer except Iran.

... **Output in Iran** rose 38,000 bbl to 581,000 bbl., the highest level since the resumption of operations in October 1954. The 9-month average was 529,000 bbl.

... **Iraqi output** of 765,400 bbl. was up 1.8 per cent. The 9-month average of 719,800 bbl. was up 34,800 bbl., or 5.1 per cent over January-September 1955.

... **Output in Kuwait** fell for the second month, down 56,900 bbl. to 1,123,600 bbl. The shaikhdom's 9-month average, however, was up 74,800 bbl. or 6.8 per cent.

Among the smaller producing areas, output in New Guinea was up for the third month in a row. This may mark the reversal of a declining trend, which had sent output from a peak of 13,500 bbl. daily in September 1954 to a low of 6,700 bbl. daily in June 1956.

The increase of 700 bbl. daily by September was believed due to development drilling in Wasian field, where a deeper producing zone was found late in 1955. The field, along with Klamono and Mogoi fields, is operated by Nederlandsche Nieuw Guinee Petroleum Mij., owned 40 per cent by Royal Dutch-Shell, 40 per cent by Standard-Vacuum Oil Co., and 20 by Caltex.

Records for Europe . . . In oil-hungry Europe, four countries set new production records.

West Germany, which has replaced Austria as the top oil country in Western Europe, increased output 900 bbl. daily to 70,600 bbl. daily. French output rose 1,600 bbl. daily to 26,800 bbl.

The Netherlands reached 21,500 bbl. daily for the first time, with an increase of 600 bbl. daily. Italian output was up 600 bbl. daily to 13,600 bbl. daily.

TREND OVER THE LAST YEAR

1955—	Western Hemisphere less U.S.	Middle East	Total, non-Communist foreign
September	3,130.4	3,256.5	7,002.4
October	3,179.6	3,378.2	7,166.0
November	3,255.0	3,386.0	7,248.3
December	3,298.5	3,316.1	7,227.2
1956—			
January	3,363.7	3,392.6	7,368.5
February	3,426.2	3,415.7	7,453.4
March	3,471.2	3,624.3	7,713.8
April	3,320.5	3,736.6	7,690.8
May	3,356.5	3,793.9	7,788.1
June	3,519.1	3,713.7	7,871.7
July	3,549.8	3,806.1	7,996.6
August	3,618.2	3,685.8	7,965.6
September	3,628.0	3,716.6	8,007.9

Crude Production Around the World

(Daily average in thousands of barrels)

Country—	September 1956	August 1956	September 1955
Western Hemisphere:			
Argentina	80.0	80.0	86.8
Bolivia	9.0	8.8	8.4
Brazil	12.0	9.3	5.5
Canada	498.0	518.2	363.0
Chile	10.3	10.2	8.1
Colombia	122.8	125.5	111.4
Cuba	1.7	1.7	0.9
Ecuador	9.7	9.7	10.0
Mexico	260.0	259.0	235.3
Peru	51.3	51.3	47.6
Trinidad	80.2	79.0	69.8
Venezuela	2,493.0	2,465.5	2,183.6
Total	3,628.0	3,618.2	3,130.4
W. Europe & Africa:			
Algeria	0.5	0.5	1.1
French Morocco	2.0	2.0	1.9
Egypt	39.6	41.7	36.3
Austria	65.4	65.6	70.0
France	26.8	25.2	19.7
West Germany	70.6	69.7	63.9
Italy	13.6	13.0	5.3
Netherlands	21.5	20.9	20.0
Turkey	6.5	6.5	3.7
United Kingdom	1.2	1.2	1.1
Yugoslavia	5.9	5.8	4.9
Total	253.6	252.1	227.9
Middle East:			
Bahrain	30.0	30.0	30.1
Iran*	581.0	543.0	381.0
Iraq†	765.4	751.9	728.8
Israel	0.7	0.7	
Kuwait	1,123.6	1,180.5	1,016.5
Neutral Zone	46.0	46.0	23.6
Qatar	122.0	127.8	117.3
Saudi Arabia	1,047.9	1,005.9	959.2
Total	3,716.6	3,685.8	3,256.5
Other Asia:			
British Borneo	117.0	117.0	116.2
Burma	4.5	4.5	3.6
India	9.2	9.2	7.5
Indonesia	260.0	260.0	240.0
Japan	5.9	5.9	6.3
New Guinea	7.4	7.2	8.2
Pakistan	5.7	5.7	5.8
Total	409.7	409.5	387.6
Free World:			
Foreign	8,007.9	7,965.6	7,002.4
United States	7,054.0	7,195.0	6,731.0
Total	15,061.9	15,160.6	13,733.4
Communist Countries in Soviet Orbit:			
Romania	200.0	200.0	125.0
Russia	1,600.0	1,600.0	1,285.0
Others	50.0	50.0	36.8
Total	1,850.0	1,850.0	1,446.8
World Total	16,911.9	17,010.6	15,180.2

*Includes estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies. †Includes estimated 3,800 bbl. daily this year and 12,000 bbl. daily in 1955 from Naft Khaneh field, operated by British Petroleum Co. rather than I.P.C.

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where complete current reports are lacking. Communist countries in the Soviet orbit include satellite countries in Europe and Red China.

More than 200,000,000,000 GALLONS

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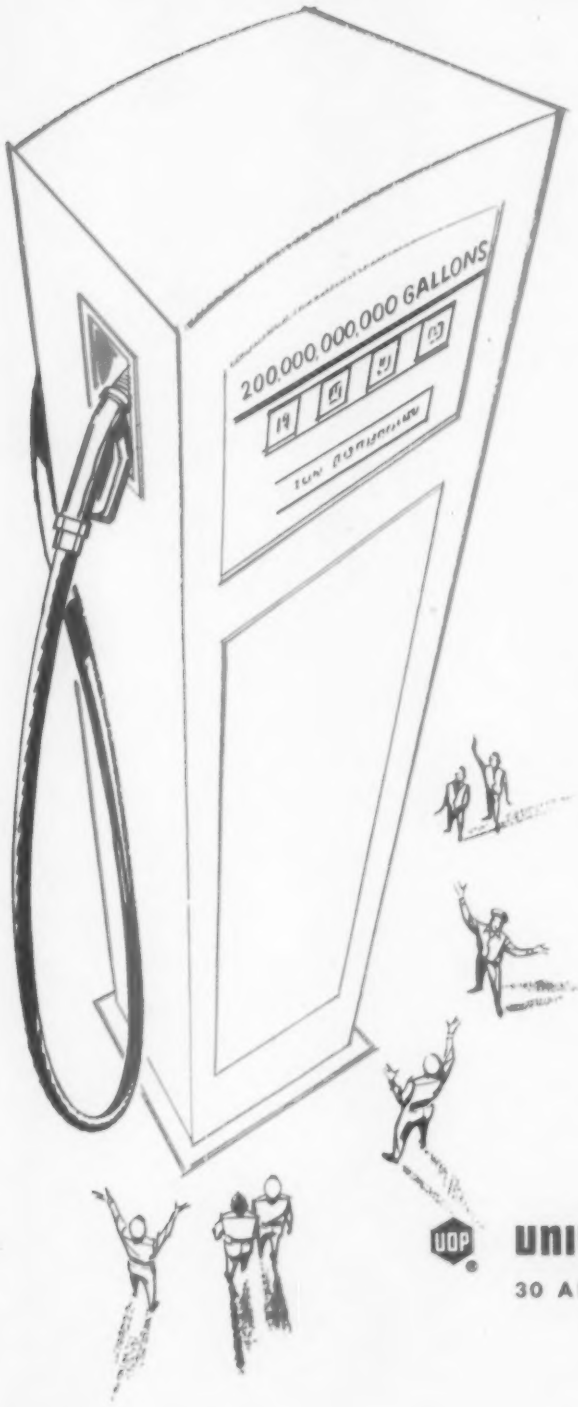

Any way you figure it, that's a lot of gasoline . . . convincing proof that the petroleum industry has approved and demanded UOP #5 Inhibitor.

Obviously, there are good, sound reasons for this preference. UOP #5 has demonstrated unexcelled inhibitor potency and versatility. It is the product you can depend on for the really tough stability jobs.

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PRODUCTS DEPARTMENT

UNIVERSAL OIL PRODUCTS COMPANY

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PRODUCTION in the Cruz Verde field east of Havana increases as . . .

Cuban Firm Expands Activity

CONSOLIDATED CUBAN PETROLEUM CORP. is continuing in the vanguard of oil activity on the island, with two new wildcats in the hopper and stepped-up production in the Cruz Verde field near Havana.

The company has obtained 7,000 acres in the Motembo field in Las Villas province and plans to drill a 6,000-ft. geological wildcat.

Motembo is an old pool, dating back to 1880, but penetration has been only to 3,000 ft. At present, 53 stripper wells are producing a total of 20 bbl. daily.

The second wildcat planned by Consolidated Cuban will be an 8,000-ft. test near Santa Clara in central Cuba. Clarence Moore, president, said Consolidated would participate on a 50 per cent basis with Gulf Oil Corp.

Best well in Cuba . . . Acquisition of acreage in or near an older producing area is similar to the company's move earlier this year in Havana province, where Consolidated picked up land in the Bacuranao area.

The firm's 1 Consolidated Cuban in Cruz Verde field, adjacent to Bacuranao, came in as the best well in Cuba. It flowed 525 bbl. daily in August and September, with present production settling down considerably. The well at present averages 200 bbl. daily from pay at 1,180 ft.

Refining Cuban crude . . . As an outgrowth of the Cruz Verde development, domestic crude production is being processed by one of the island's major refineries for the first time in recent years.

Consolidated Cuban is trucking its 28°-gravity crude to the 8,000-bbl. Belot plant near Havana under a contract with Esso Standard Oil Co., S.A. The refinery is 4 miles from Cruz Verde.

The other four producing wells on the company's acreage—2 Consolidated Cuban, and 1, 2, and 3 Cruz Verde—are producing about 65 bbl. daily.

The 4 Cruz Verde was being bailed at 35 bbl. daily during recent completion at 930 ft.; the 3 Consolidated Cuban was drilling at 530 ft., and an eighth one was under way.

Chile Oil Law Up for Vote

Chile's president, Carlos Ibanez, last week sent to congress a bill which would authorize him to grant oil concessions to private companies on the basis of a 50-50 profit split with the government.

The legislation, long pondered by Chile, is expected to meet with opposition in congress. It was prepared by the Chile Ministry of Mines.

The bill would allow the president to grant exploration concessions for an initial 4-year term covering up to 10 tracts of 123,500 acres each at an annual rental of 12.5 cents per acre. Development concessions would range from 30 to 40 years on a total of 61,750 acres to any one company. The bill provides for a 15 per cent depletion allowance on production.

The present producing fields in Chile's Tierra Del Fuego would remain under the control of the government oil agency. These 18 small fields now produce about 10,000 bbl. daily.

International BRIEFS

An electric desalting plant has gone on stream producing 86,400 gallons of fresh water daily from salt-water wells at Bahrain in the Persian Gulf. The unit supplies the needs of some 5,000 persons at Awali, near Bahrain Petroleum Co., Ltd.'s big Bapco refinery. Unlike distillation units, this one leaves the air—and thus the taste—in the water. It was built by Ionics, Inc., of New York.

A new 6,700-bbl. daily Platformer has gone on stream at the 36,000 bbl. daily refinery at Geelong, Australia, operated by Shell Co. of Australia, Ltd. Addition of the new unit completes the third construction stage at the refinery and increases the Shell company's capital investment to almost $62 million.

The Thailand Government wants to get into retail marketing. It made its intention known after a domestic press campaign called for an end to a "monopoly" by private companies. A government spokesman said changes would be sought in agreements made in 1947 with Standard-Vacuum Oil Co. and Royal Dutch-Shell. Caltex also markets in the country.

Ste. des Petroles de Valence, half owned by the British Petroleum Group, has acquired a new exploration license over 240 sq. miles in the lower Rhone Valley in France. The company holds two other licenses further north in the Valence Basin. A deep test is under way at St. Lattier.

Petroleos Mexicanos has brought in a new natural-gas discovery about 72 miles south of Veracruz. The 4 San Pablo tested 12,000 M.c.f. daily through a 10-mm. choke. Three wells drilled lower on the same structure earlier this year were dry holes.

The Japanese Government is pressing three private companies considering synthetic-rubber plants to drop their projects and back a semiofficial company. This company would go into production by 1959. It would produce 30,000 tons a year at first, and raise output to 45,000 tons a year by 1962.

Russia has reported a 730-bbl. daily discovery at about 10,000 ft. in the Caspian Sea. The test was located about 8½ miles offshore near Peschany Island.

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We've learned from long experience in developing new bit designs that you can't rely on spot bit runs to tell how a bit will really perform. You can only be sure of *predictable* performance when results have been repeated and repeated. Not only in one field, but under comparable conditions in many different fields.

There are other variables, too. Formations change from location to location and field to field. Weight makes a difference. Rotating speeds, mud characteristics and mud volume and pressure make a difference.

Each year, hundreds of thousands of bit records and dulled bits are analyzed by Hughes engineers in evaluating design and metallurgical changes. This is another *big* reason why the performance of HUGHES rock bits is the *world standard of the industry!*

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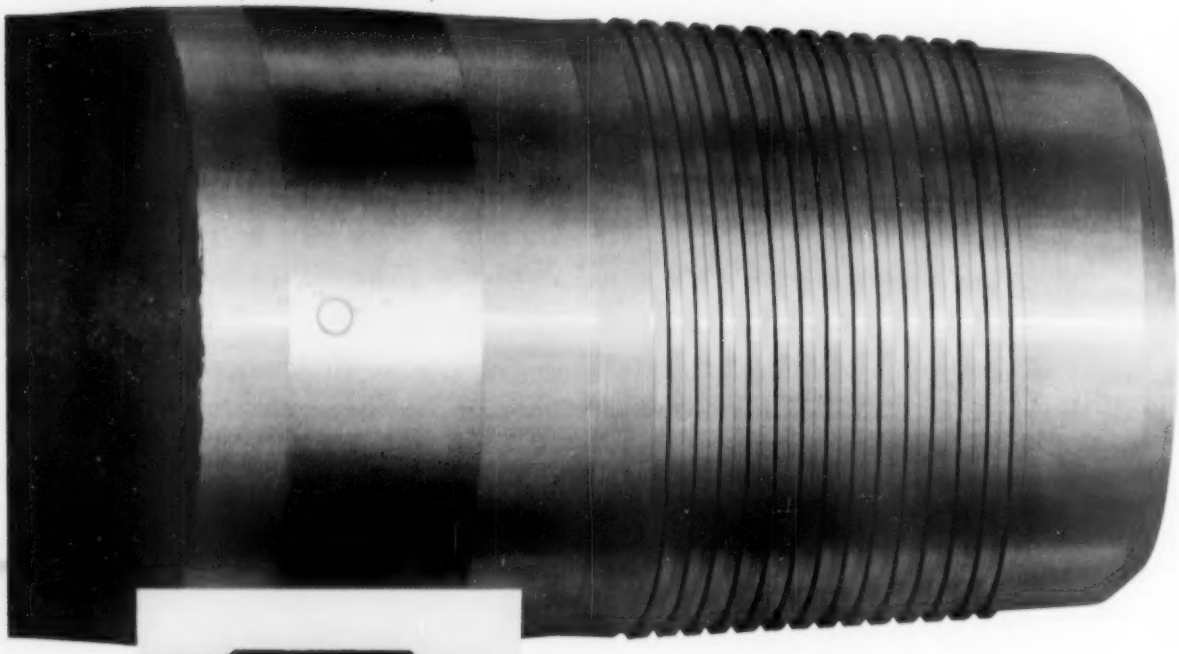
for operators who prefer replaceable tool joints!



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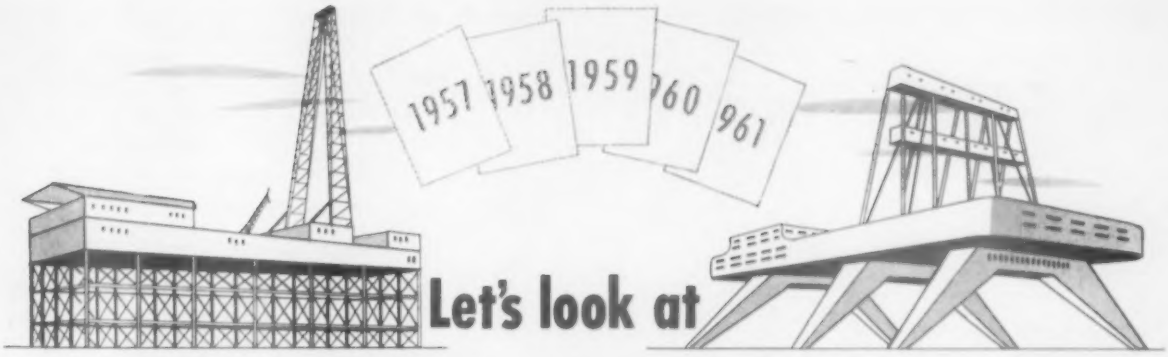


Let's look at

OFFSHORE MOBILE UNITS

. . . as they are today and might be tomorrow

Summarized here are the designs produced by 5 years of development of offshore mobile drilling units. Also, here's a look ahead at current trends and potential development of such equipment.

by R. J. Howe
and
B. G. Collipp

THE number of mobile offshore drilling units has been increasing steadily since 1949. At the end of 1955, there were approximately 13 in use. The number in operation should double during 1956.

This is a spectacular development since each unit costs from 2 to 7 millions. Although there has been a wide variation in the design of these 25 or more mobile units, they have progressed fairly orderly from shallow to deep water drilling.

Problems . . . As with any new type of equipment, offshore mobile units have had their share of problems. Examples are: piling difficulties, pontoon-control problems, jack failures, fire, movement during moderately severe storms, and many other minor problems. Nevertheless these setbacks have been met and all of the mobile units which have experienced difficulties are actually operating today.

Amount of equipment . . . As with fixed platforms, it is possible to divide mobile units into two classes depending upon how much equipment is located on the unit proper. Except for one recently announced design, all mobile platforms are self-contained because all drilling equipment, including crew quarters, is built into the unit.

Authors are with the technical services division of Shell Oil Co.'s exploration and production department, Houston. Paper presented at the 1956 Petroleum Mechanical Engineering Conference of the A.S.M.E., Dallas.

The other possibility is to locate only the derrick, draw works, engines, and perhaps a circulating mud pump on the mobile unit and use the unit in conjunction with a drilling tender containing the pipe racks, mud pumps, mud pits, mud storage, water storage, crew quarters, etc. This arrangement may be called a tender-type of mobile unit. Although the tender-type of mobile platforms has not been used, a great majority of the world's offshore wells have been drilled from the tender-type of fixed platforms.

Installation method . . . Another convenient means for classifying mobile units is by their method of installation. They fall into four classes as follows:

1. **Fixed deck units.** During installation these units maintain a fixed relationship between the support hull which is being submerged and the drilling deck. Generally, some type of auxiliary buoyant members, such as pontoons or bearing feet, is used to maintain stability after the support hull is submerged.

2. **Elevating deck units.** This type of mobile platform moves on location with the drilling deck floating, establishes vertical support from the soil by means of piling or bearing plates, and elevates the deck to the desired height above water.

3. **Elevated deck units.** Installation of these units is similar in every respect to that of elevating deck units except the drilling deck remains at a constant elevation during the entire installation procedure. The deck is carried by a barge which is sunk for bearing support purposes or by barges or auxiliary buoyant members which are completely removed after installation.

4. **Floating type of units.** Recent unitization of anchored ships for coring and drilling work in California coastal water has necessitated the addition of this category. It applies to all platforms which remain floating during drilling operations.

Method of support . . . The final way to differentiate between mobile designs is to divide them according to their method of soil support. The four possibilities are: piling support, hull support, piling plus hull support, and anchor support.

These methods are self-explanatory; however, it is difficult to classify exactly some of the intermediate cases such as hull support units. These units have mud fins or vertical plates extending into the soil, and only the major means of support require identification.

Present Designs

A summary of all mobile units which were in operation, under construction, or announced, as of July 1, 1956, is presented in Table 1. This information is subject to change since even the units which have been in operation for

Table 1—Mobile Units in Operation, Under Construction, or Announced as of July 1, 1956

Owner, name, and builder—	Date of completion	Depth (ft.)	Classification (Figs. 1 and 2)	Dimensions (ft.) length by width by height
1. Kerr-McGee Oil Industries, Inc.—Rig 40—Alexander	1949	20	IB, IIA4, IIIB	Hull: 160 by 54 by 13 Two pontoons: 110 by 14 by 13
2. The California Co.—S-44—Alabama Dry Dock	1954	20	IB, IIA5, IIIB	Hull: 156 by 90 by 11 Four feet: 35 by 10 by 3
3. ODECO—Mr. Charlie—Alexander	1954	40	IB, IIA2, IIIB	Hull: 220 by 74 by 14 Two 10 by 30 by 50 pontoons
4. Offshore Co.—No. 1—Consolidated Western	1954	50	IB, IIB1, IIIA	Hull: 203 by 70 by 8 Twelve piles: 6-ft. diameter
5. C. G. Glasscock Drilling Co.—Mr. Gus—Bethlehem	1954	100	IB, IIC1, IIIC	Hull: 220 by 80 by 15 Eight piles: 4-ft. diameter by 280
6. Kerr-McGee Oil Industries, Inc.—Rig 44—Ingalls	1954	40	IB, IIA4, IIIB	Hull: 140 by 72 by 13.5 Two pontoons: 140 by 13.5 by 13
7. Royal Dutch-Shell (Persian Gulf)—Hollandsche Constructie Werkplaatsen, Leiden, Netherlands	1954	100	IB, IIC2, IIIA	Deck: 131.8 by 85.3, two 1,800-ton barges Six open square legs
8. Offshore Co.—No. 2—Consolidated Western	1955	100	IB, IIB1, IIIA	Hull: 220 by 117 by 13.5 Fourteen piles: 6-ft. diameter
9. Offshore Co.—No. 3—Alexander	1955	40	IB, IIA2, IIIC	Hull (with extensions): 220 by 74 by 12 Four piles: 6-ft. diameter
10. ODECO—John Hayward—Alexander	1955	25	IB, IIA2, IIIB	Hull (with extensions): 180 by 120 by 10
11. American Tidelands—101—Alexander	1955	40	IB, IIA3, IIIB	Hull: 200 by 74 by 12 Four pontoons: 50 by 30 by 10
12. Kerr-McGee Oil Industries, Inc.—Rig 45—Ingalls	1955	35	IB, IIA4, IIIB	Hull: 142 by 69 by 13.5 Two pontoons: 146 by 11 by 10
13. Penrod Drilling Co.—Levingston	1955	30	IB, IIA6, IIIB	Drydock hull: 220 by 72 by 10
14. Standard of California—Western Explorer	1955	500	IB, IID1, IIID	205-ft. converted L.S.M.
15. Richfield Oil Co.—Rincon—Craig Shipbuilding	1955	500	IB, IID1, IIID	205-ft. converted L.S.M.
16. Offshore Co.—No. 54—American Bridge	1956	100	IB, IIB1, IIIA	Hull: 200 by 105 by 15 Eight open towers: 12 ft. square by 200
17. Offshore Co.—No. 55—American Bridge	1956	100	IB, IIB1, IIIA	Hull: 200 by 105 by 15 Eight open towers: 12 ft. square by 200
18. Zapata Offshore Co.—Scorpion—LeTourneau	1956	70	IB, IIB1, IIIA	Three open legs: 20 by 80 by 140
19. Coral Drilling Co.—Mr. Arthur—Alabama Dry Dock	1956	70	IB, IIA5, IIIB	Hull: 180 by 151 by 12 Four feet: 50 by 24 by 4
20. Delta Offshore Co.—Avondale	1956	25	IB, IIA5, IIIB	Hull: 156 by 90 by 11 Four feet: 35 by 10 by 3
21. Mene Grande (Lake Maracaibo)—No. 12—Levingston	1956	25	IB, IIB1, IIIA	Hull: 140 by 65 by 10 Ten piles: 2.5-ft. diameter by 60
22. The California Co.—S-45—Avondale	1956	25	IB, IIA5, IIIB	Hull: 156 by 90 by 11 Four feet: 35 by 10 by 3
23. The California Co.—S-55—Avondale	1956	75	IB, IIA5, IIIB	Hull: 190 by 150 by 12
24. ODECO—Margaret—Alabama Dry Dock	1956	65	IB, IIA1, IIIB	Hull: 200 by 300 Catamaran
25. ODECO—St. Louis—Alexander	1956	30	IB, IIA2, IIIB	Hull (with extensions): 120 by 180 by 10
26. Kerr-McGee Oil Industries, Inc.—Rig 46—Ingalls	1956-57	70	IB, IIA4, IIIB	Not announced
27. Kerr-McGee Oil Industries, Inc.—Rig 47—American Bridge	1956-57	70	IB, IIA6, IIIB	Not announced
28. Placid Oil Co.—Levingston	1956-57	100	IB, IIA1, IIIB	Twin hulls: 178 by 72
29. John W. Mecom—Levingston	1956-57		IB, IIA6, IIIB	Drydock: 220 by 78 by 48
30. Penrod Drilling Co.—Bethlehem	1956-57	70	IB, IIC1, IIIC	Hull: 190 by 150
31. Penrod Drilling Co.—Levingston	1956-57	18	IB, IIA2, IIIB	Hull: 180 by 50
32. Penrod Drilling Co.—Levingston	1956-57	18	IB, IIA2, IIIB	Hull: 180 by 50
33. Glasscock Offshore—Rig 12—Bethlehem	1957	125	IB, IIC1, IIIC	Hull: 200 by 180 by 20 Four telescoping piles: 10-ft. diameter
34. Humble Oil & Refining Co.	1957	70	IA, IIC2, IIIA	Deck: 75 by 85 Transport floats: 36-ft. diameter
35. Southeastern Drilling Co.—Rig 22—Avondale	1957	25	IB, IIA5, IIIB	Hull: 156 by 90 by 11 Four feet: 3 by 10 by 35
36. Monterey, Humble, and Seaboard—Healy Tibbitts	1957	90	IB, IIB1, IIIA	Hull: 200 by 100 by 13
37. Louisiana Offshore—Ingalls	1957	65	IB, IIA5, IIIB	Hull: 180 by 150 by 12
38. British-French Co. (Persian Gulf)—Dusseldorf, Germany	1957	100	IB, IIB1, IIIA	Hull: 190 by 106

several years are still being modified. Also, the depth ranges quoted are approximate and depend upon the design criteria used, location, soil conditions, time of year, and many other variables.

Related Developments

During recent years there have been a number of world-wide mobile-platform developments not directly connected with the search for oil. These platforms, which are used for purposes ranging from radar platforms to portable docks, have many features common to mobile drilling units. They can be classified with the same system. In this instances these platforms have been installed permanently; however, their method of installation could have been reversed if it were desired to move them.

DeLong docks . . . The DeLong docks, which have been used in a number of locations, including Greenland and Venezuela, operate on the elevating-deck principle. The floating barge or hull is lifted with pneumatic jacks acting on circular caissons. When the dock is in place, the caissons are welded to it, jacks removed, and caissons cut off flush.

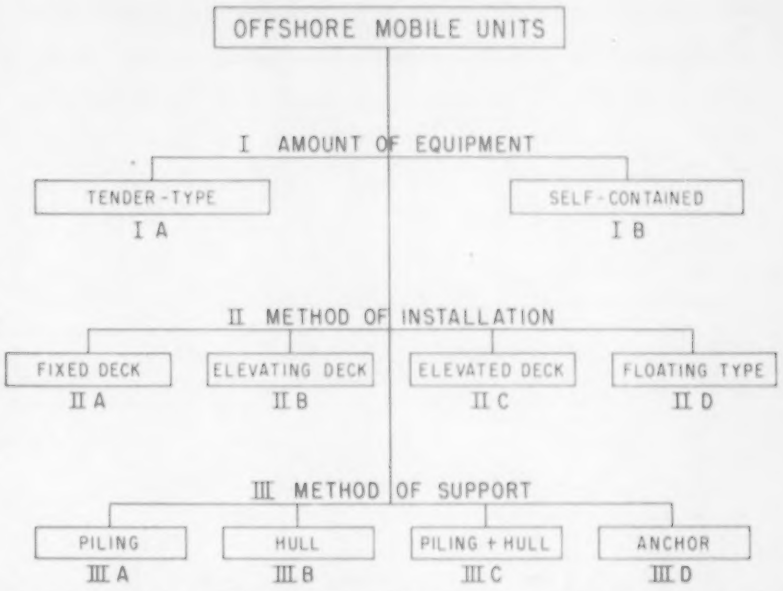
The dock located in the Orinoco River in Venezuela was constructed in three sections and has a total length of over 1,000 ft., width of 82 ft., depth of 15 ft., and a clearance of 30 ft. above the low water level. This principle was utilized in the design of Offshore Co.'s Nos. 1 and 2 units.

DeLong core-drilling platform . . . This platform was successfully used in the summer of 1954 to obtain foundation data at proposed sites for Texas Towers radar stations. The platform measured 60 by 250 ft. and was equipped with twelve 6-ft. diameter piles 120 ft. long.

The piles were individually controlled by DeLong pneumatic jacks each half of which alternately grips the pile using an inflatable rubber boot. There were four core-drilling rigs on the platform capable of operating simultaneously.

Texas Towers . . . The first of five Texas Towers radar stations was installed in 1955 in about 60 ft. of water, 100 miles off Cape Cod. The platform is triangular and measures approximately 200 ft. on a side. It could be called an elevating deck platform since the floating hull was lifted some 70 ft. in the air by 12 temporary 6-ft. piles. Each pile was controlled by two DeLong jacks acting in series.

After elevation, three permanent piles located in the corners were lowered, jetted into place, and filled with reinforced concrete. Permanent piles have an upper section 10 ft. in diameter and 145 ft. long, and a lower section 14 ft. in diameter, 65 ft. long with 2-in. steel throughput. After the main piles had been cemented in place, the 12 lifting piles were removed. The platform weathered a very severe winter storm late last year.



CLASSIFICATION METHOD for mobile drilling units gives a number and letter designation for each of the three features—amount of equipment, method of installation, and method of support. See Table 1. Fig. 1.

British platform . . . It was reported recently the British have successfully used a mobile core-drilling unit to determine the extent of coal deposits which lie under the sea. This shallow-water platform is of the fixed-deck variety and is stabilized during sinking by horizontal pontoons controlled by cables.

Floating units . . . The use of stratigraphic core-drilling ships on the Pacific Coast certainly would be considered as a development which is closely related to oil-well drilling, but this will be discussed later. Also, mobile foundation core-drilling barges have been operated successfully in the gulf during good weather in water depths approaching 100 ft.

Recently, a newspaper article revealed that one company had drilled core holes from a floating barge in the gulf to evaluate sulfur deposits.

Current Trends

During the first 5 years of mobile-platform development there was considerable variation in both the over-all design and water-depth capabilities. However in the past year there has been an increasing trend toward repeating certain designs. This is a result of a number of factors.

First, the number of units is increasing so fast technical manpower is not available to prepare and evaluate many new designs. Second, 5 years of mobile-unit experience has furnished enough information to modify certain existing units rather than devise radical new designs.

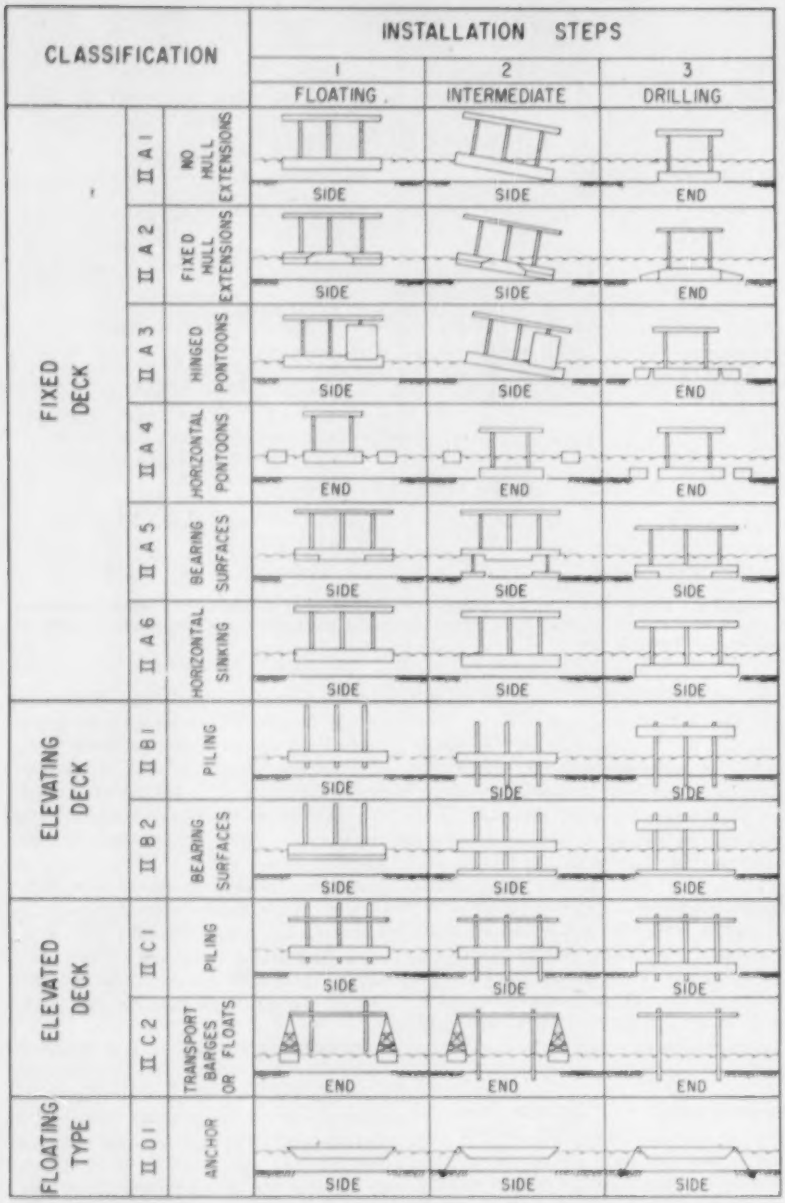
Another related factor is that none of the 25 or more units currently in operation has been subjected to a maximum hurricane condition. When this occurs there will no doubt be a number of design modifications indicated.

Open-fabricated legs . . . Use of open-fabricated legs constructed of circular members has increased over single circular piling to support deep-water mobile platforms. Why? Because with a circular pile an increase in diameter to increase the section modulus (bending resistance) generally causes an appreciable increase in the wave forces.

The open-fabricated leg provides a design technique to increase the section modulus, at the same time keeping the increase in wave forces at a minimum. Of course, the final design selected is based on which will do the best job for the least money.

Another facet of piling design is the jacking problem. It is a difficult task to transmit loads approaching 1,000 tons from a platform to a smooh circular pile 5 or 6 ft. in diameter. The early circular-pile designs used inflatable rubber boot-type of jacks which were subsequently backed up with steel teeth for a better grip.

Another unit is driving and pulling piles by means of a double slip ar-



INSTALLATION DETAIL is denoted by addition of Arabic numeral to the broad class shown in Table 1. Fig. 2.

rangement in much the same manner as a casing hanger. One new open-leg design is using a rack and pinion device while another has a staggered hydraulic-pin arrangement to raise and lower its legs.

Shaped hulls . . . Some of the newer mobile units have incorporated streamlined bearing hulls to reduce large wave forces acting on these submerged surfaces. Even though they are located as much as 50 or 75 ft. below the water's surface, the forces on the hull alone can account for as much as 80 per cent of the total wave forces. It is also felt that streamlining increases the resistance of hulls to scouring action resulting from waves and currents.

Multiple-well derricks . . . Some of the new designs, particularly the deep-water ones, are using multiple-well derricks capable of drilling several wells from one location. This trend is probably the result of two factors. First and foremost is the cost of erecting production platforms in deep water.

Even for a single well the platform must be quite substantial and the addition of five more wells usually will not even double the cost. This is not true in shallow water where a very simple wellhead protector can be erected and production collected at a central manifold platform.

Another factor involved in the trend toward multiple-well derricks is the cost of moving a large mobile unit to another location even if it is just a short distance. It usually takes 1 or 2 days to move a large unit under ideal weather conditions and since they cost $6,000 to $10,000 a day to operate, the expense of five additional moves to drill six wells becomes significant. Also, weather conditions are usually not ideal, which can result in delays ranging up to a week or more. Weighed against these advantages are the additional lost of direrttional holes and increased hazards associated with multiple-well platforms.

One other very important feature of some recent designs is the adjustable crown block and rotary table which may be moved several feet in two directions. In most instances, when a mobile platform is moving onto a location where the wellhead platform and/or well protector already have been installed, as much if not more time is spent adjusting the unit the last foot than with the rest of the installation.

The same problem will face mobile workover units but to a greater extent. The adjustable crown block and rotary table permits fine alignment to be accomplished without requiring a shift of the mobile unit.

Installation technique . . . Most of the fixed-deck type of mobile units use stabilizing equipment when going on location. This equipment has taken the form of pivot pontoons, footpads, side pontoons and dumbbell-shaped hulls.

Recently, several fixed-deck type of mobile units have gone to vertical columns to provide the necessary sinking stability. Since the sinking stability is a function of the moment of inertia of the waterplane area of these columns, they have been placed far apart to keep their size reasonable. Therefore the plant area of the rigs has been enlarged with the largest one currently under construction about 200 by 240 ft.

These columns have eliminated many of the moving parts employed with other techniques and have reduced the construction cost and the possibility of equipment failure. This feature also provides a unit which is stable when floating. The lower hull only a few feet off the ocean bottom should enhance the ability to position on location.

Drilling slot . . . The relationship between the mobile unit and wellhead jacket is finally being considered. It is difficult to install a wellhead jacket in the deeper waters because many of the earlier units have narrow slots restricting the size of wellhead jacket.

Most of the more recent units have considerably larger slots and some have even eliminated the slot by cantilevering the derrick floor over the side of the rig.

To further assist the units in aligning over the well, winches have been installed on some of the mobile units. Cables attached to the wellhead are controlled by these winches and help to guide the unit onto location and hold it there while drilling.

The possibility of installing the wellhead jacket with equipment aboard the mobile unit also has been under investigation. Stiff-leg derricks for handling the jacket, pile drivers located conveniently in the drilling slot, and drilling masts which can tilt over and be used for heavy lifts now are all realities and should greatly extend the versatility of the equipment.

Future Designs

Based upon current trends, there appears to be a number of features which will be incorporated into new designs during the next 5 years. In such a new and rapidly changing field as offshore drilling, it is difficult to predict what methods will be employed 5 years from now. However it is possible to make general engineering speculation on certain points.

Mobile-unit designers appear to be thinking in terms of different types of design for various water depths. This has evolved partly from the costs of the various designs. Certain designs, usually fixed deck, are less expensive to construct—have proved very satisfactory in the shallower waters. Unfortunately these designs appear to be limited to water depths less than 70 ft.

Mobile units for greater water depths have evolved designs of probably the greatest diversity. All these designs now use jacks of some type which drive piling or elevate the drilling deck. These devices are expensive and have made the units costly to operate. What effect drilling from floating vessels, which appears less expensive, has on these units will be determined in the future.

The wide variance in construction costs and operational costs has dictated that each mobile unit should be used near its maximum depth range for maximum economy. Therefore any far-sighted development program would show different designs of mobile units operating near their limit in the various water depths.

Shallower water . . . The successful marsh rigs has had little publicity. Many of these mobile units have operated offshore in the shallower waters at rates considerably below the deeper-water rigs.

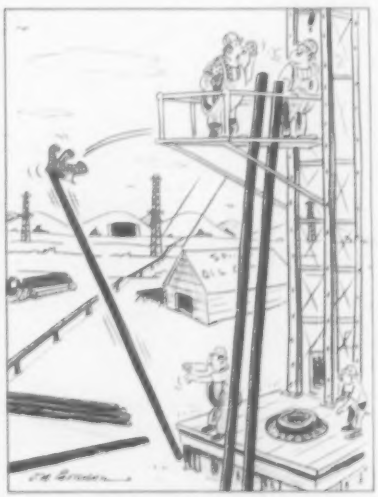
"With the advent of floating drilling platforms in California, it is difficult to say just what the maximum water depth will be in the next few years, but a good guess would be about 250 ft. for conventional mobile and fixed platforms and 600 ft. for floating units."

A large per cent of present leases lie in shallow water, so there appears to be an opportunity for a new unit design to operate as inexpensively as the marsh rig and withstand adverse conditions as the mobile unit.

Deeper water . . . The average depth of water in which exploratory wells are being drilled will increase in subsequent years as will the maximum depth. The water-depth record for the Gulf of Mexico is now about 100 ft. and it is about the same for Lake Maracaibo.

With the advent of floating drilling platforms in California, it is difficult to say just what the maximum water depth will be in the next few years, but a good guess would be about 250 ft. for conventional mobile and fixed platforms and 600 ft. for floating units.

Cost reductions . . . The cost of mobile platforms for a given water depth and similar design criteria should certainly be reduced in the future. More operating experience is available and designs will become somewhat standardized. There has been a substantial variation in both the design criteria and basic principles utilized with a resulting range of initial costs. Generally all mobile units (excluding drilling equipment) seem to cost approximately $40,000 per foot of water-depth potential.



"You see my coat? I coulda' swore I hung it up here somewheres."

Floating platforms . . . The advent of ships in California designed to drill core holes and even test wells is a significant contribution to offshore progress. One group on the West Coast has been drilling core holes since 1954. However, the first public announcement of this type of operation came late in 1955 when Standard Oil of California unveiled its converted L.S.M. core-drilling barge.

Early in 1956, one magazine revealed a similar conversion by Richfield Oil Corp. which has tested a well about 4,000 ft. deep in approximately 50 ft. of water. (The information from test wells will be used to locate a 200-ft.-sq. earth-filled drilling island in the Rincon area.) In addition, the Continental, Union, Shell, and Superior group has two such barges and Western Gulf Oil Co. has one. General Petroleum Corp. and Humble Oil & Refining Co. are in the process of equipping similar barges.

With a water-depth potential of 600 ft. and more, the floating type of drilling platform should open vast submerged areas heretofore not considered for oil exploration. Its use in the Gulf of Mexico may be somewhat restricted because both the average and maximum oceanographic conditions are more severe. However, it is almost certain that these obstacles will be overcome.

Underwater completions . . . One of the key problems in the development of floating drilling units or any other mobile unit is the design of a technique for completing wells under water. A number of oil companies and manufacturers are working on this operational method. The solution will speed up all types of mobile drilling.

Streamlining . . . As more becomes known about the exact nature of forces acting on offshore facilities, units probably will be built in a more streamlined fashion from the hull resting on bottom up to the derrick. Some units are now using streamlined bearing hulls to reduce the tremendous forces acting on these surfaces.

Two Moves Pay Off at Catesville

Unitization will allow better placement of wells, higher oil recovery, and reduced operating expense. Extra benefits will accrue from the extraction of bromine from produced brine.

by Eugene E. Kincaid

ON July 18, 1956, the Arkansas Oil and Gas Commission approved the petition by Murphy Corp. and William C. and Theodosia M. Nolan to unitize Catesville field. Purposes of the unit are to prevent waste and to increase ultimate recovery. Such an increase will be obtained, not by the usual vehicle of water flooding or pressure maintenance, but rather by the ability to complete wells most economically within the developed area. Location of the wells on the best geological positions along with consolidation of operations will allow higher recovery to be attained from this multizone field.

A plant designed to extract bromine from the Smackover brine is jointly owned by Michigan Chemical Corp. and Murphy. Operation of the plant is by Michigan. Location at Catesville gives a number of important advantages among which are: high content of bromine in the brine, field operation under a single company, excellent rail and road facilities, low cost fuel, and regional market outlets.

Field

Catesville field is located in Union County in South Central Arkansas. Fig. 1 is a map of the oil fields in South Arkansas showing the location of Catesville which underlies the southern portion of South El Dorado field. In April 1950, C. H. Murphy & Co. completed the Catesville discovery in NE SE NE Section 32 which produced dually from the Jones and 6,600-ft. sands.

At the present time there are eight producers, two abandoned wells and three dry holes as shown on the field map of Fig. 2. Four of the wells are producing from the Smackover limestone and four from Cotton Valley sands.

Geology

A strong Smackover nose that trends east-west with a regional dip to the south brought about the structure and provided for the accumulation of oil held in place by water. The limestone produces from the "Reynolds" or upper porous oolitic member which contains thin lentils of dense lime that materially affects the oil-water contact.

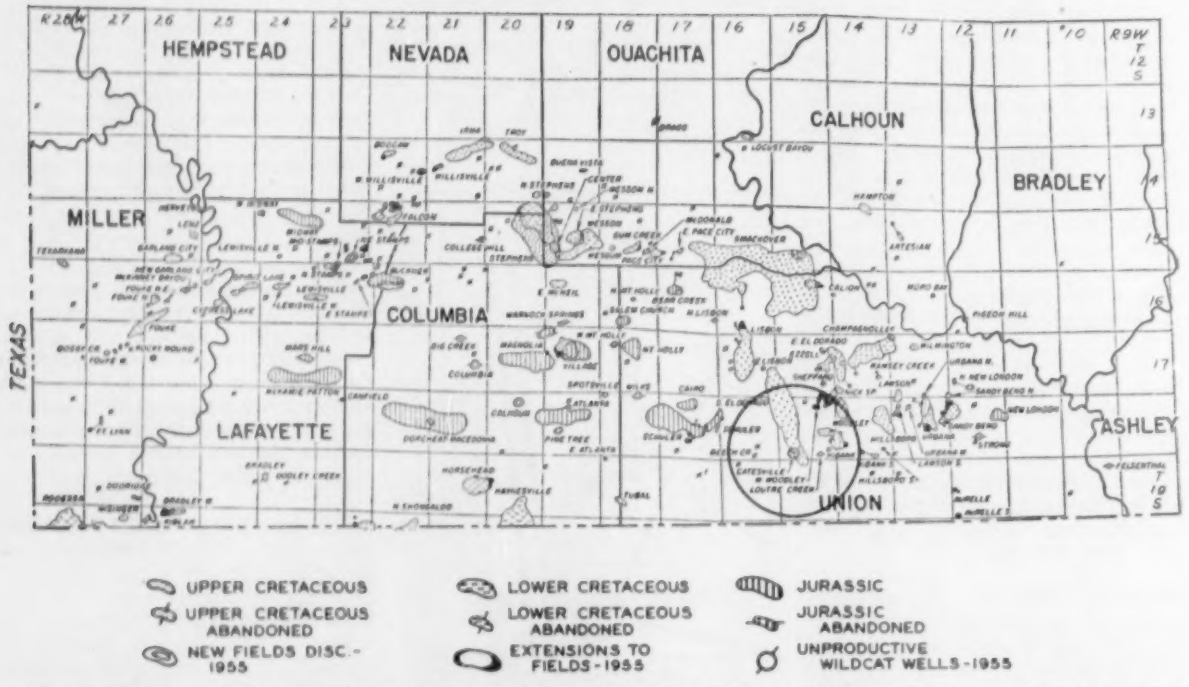
Above the Smackover the Buckner formation has been stripped away leaving the Cotton Valley Group unconformably on the lime. The Cotton Valley sands are very lenticular with no one productive zone underlying the whole field. Apparently all of the sands contain bottom or edge water which appears fairly active and possibly the sands contact one another at some area. Correlation of the sands across the field is very difficult.

All of the zones in the field have relatively thin oil columns. Due to the low structural relief, that has a maximum closure of 20 ft., and the active water, all producing zones are making water.

Development

With depths ranging from 5,300 to 7,800 ft. and with thin oil sands, wells could not be completed economically on close spacing. Forty-acre drilling

PRODUCING



CATESVILLE FIELD underlies the southern portion of South El Dorado field in southern Arkansas. It produces oil from Cotton Valley sands and the Smackover lime. Brine from the Smackover contains sufficient bromine for commercial extraction. Fig. 1.

units were formed based upon the governmental quarter-quarter sections.

Dual completions were permissible but lack of natural flow coupled with small-diameter casing brought about single completions early. Table I shows the well-completion data for the field. Maximum field-wide production was achieved in January 1951 at a rate of 22,800 bbl. for the month. A steady decline in production, as evidenced by Fig. 3, has occurred since. In June 1956 the production dropped below 6,000 bbl.

Reservoir Characteristics

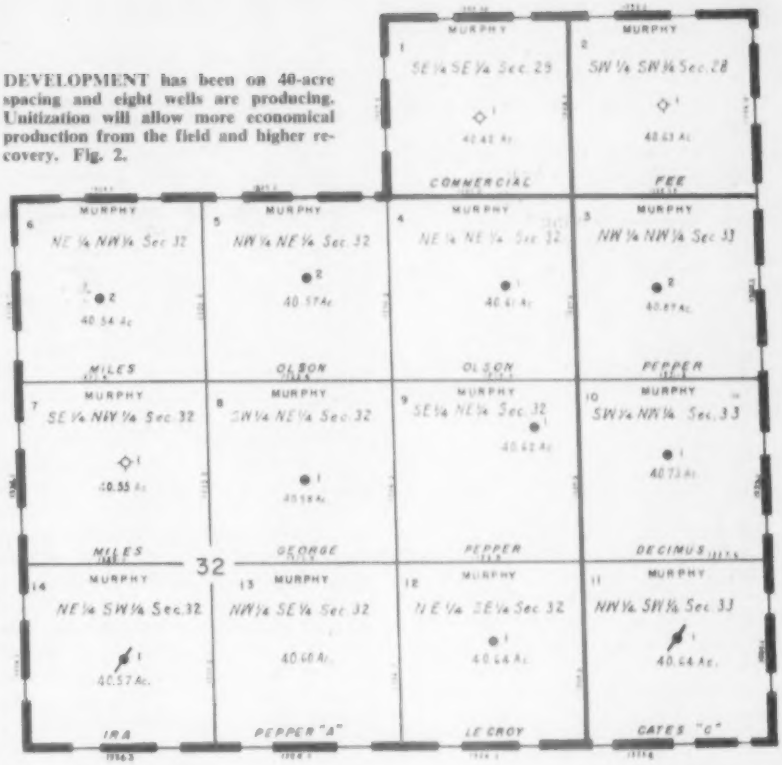
The Cotton Valley sands exhibit fairly good to poor permeability with averages ranging from 34 to 567 md. Porosity of the zones varies on an average from 13.7 to 22.4 per cent. The Smackover has an average permeability of 1,060 md. although the range is great. The porosity of the limestone is somewhat better than the average Smackover in South Arkansas, being 18.9 per cent.

Total stock-tank oil for the known productive horizons is approximately 17 million barrels. A number of zones indicated to be productive from the electric-log characteristics and core analyses have not been tested and were not included as known productive zones. The over-all oil in place may be in excess of 25 million barrels. Production to date has amounted to 810,000 bbl.

Unitization

Recognized low recoveries and the slow rate of production from this multizone field indicated the need for implementing greater rates of production. The unit type of vehicle was deemed the most feasible inasmuch as it would protect the correlative rights and would also provide a way to increase production through more well bores.

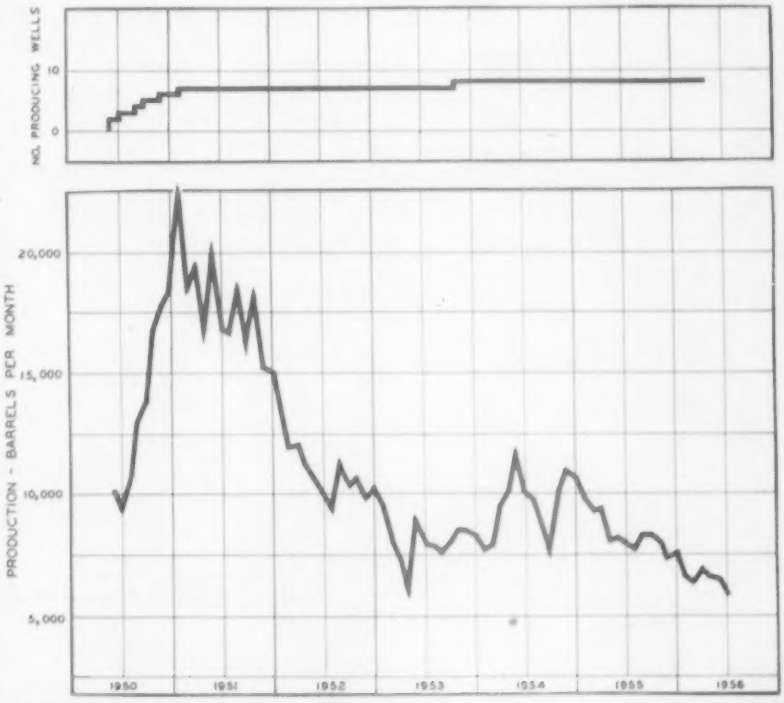
Erasure of the lease lines would allow for additional wells to be drilled on the best geological prospects, and consolidation of operations could be made. The increase in ultimate recovery under unitization was estimated to be 628,000 bbl. Increased operating profits to the working interest was estimated to amount to $1,829,000 or a total of $1,556,000 after deducting the cost of the unit program. The added recovery would also increase the revenues to the royalty by an estimated $216,000.



DEVELOPMENT has been on 40-acre spacing and eight wells are producing. Unitization will allow more economical production from the field and higher recovery. Fig. 2.

Participation . . . Under the Arkansas statutes all or a part of a source of supply may be unitized provided that:

1. An increase in recovery be obtained with value in excess of the costs incurred.
2. There is prevention of waste and



DECLINING PRODUCTION shows why the field was unitized. Location of wells on best geological positions should boost production and recovery. Fig. 3.

THE AUTHOR

Eugene E. Kincaid is reservoir engineer for Murphy Corp., El Dorado, Ark. He joined Murphy in 1955, following experience with Carter Oil Co. He is a native Oklahoman, and holds a B.S. degree in petroleum engineering from University of Tulsa.

the safeguarding of correlative rights.

3. Seventy-five per cent of working and royalty interests have concurred.

4. Formation is based upon relative tract value other than physical equipment.

5. The Oil and Gas Commission duly approves after a public hearing.

Participation of Catesville was obtained by giving two-thirds credit to the oil produced during the period April 1, 1955, to April 1, 1956, and one-third credit to the acre-feet of known productive sand. This formula met with the approval of over 82 per cent of the royalty interest and over 99 per cent of the working interest at the time the petition was submitted.

Area . . . The unit area was selected to include the known productive extent of the field. Due to the difficult correlation it was deemed valid to carry only the productive zones through the quarter-quarter section actually having the sand in the well bore for the perimeter wells. Provisions were then made in the agreement for expansion of the unit provided productive sand was found outside the unit area and vith proper approval.

Bromine Project

Analyses of the Smackover brine show a high concentration of bromine. In searching for a way to economically extract this bromine Murphy joined in a venture with Michigan Chemical Corp. to erect a manufacturing plant and market the product.

TABLE 1—WELL-COMPLETION HISTORY, CATESVILLE FIELD, ARKANSAS

Well—	Date completed	Zone	Initial potential Bbl. oil /day	Initial potential Bbl. water /day	Present zone	Date opened	Initial potential Bbl. oil /day	Initial potential Bbl. water /day
1 Decimus	8- 3-50	Smackover	83	144	Same			
1 George	9-20-50	Smackover	129	3	Same			
1 LeCroy	1-10-51	Smackover	65	0	6,000 ft.	Oct. 1954	57	282
2 Miles	10-23-53	Smackover	66	0	Same			
1 Olson	5- 1-50	Smackover	602	0	6,850 ft.	Oct. 1954	115	0
2 Olson	5-29-50	Smackover	116	0	Same			
1 Pepper	2-23-50	Jones	94	0	Same			
2 Pepper	11-13-50	6,600 ft.	111	0	Same			
1 Commercial	10-17-50	D & A						
1 Fee	6-26-50	D & A						
1 Miles	3-15-51	D & A						
1 Ira	7-22-50	6,600 ft.	50	0	P & A June 1952			
1 Cates "C"	4- 1-41	6,000 ft.	20	200	P & A May 1941			

Smackover brine at Catesville averages about 44 lb. of bromine per 1,000 gal. or 1½ lb. per bbl. This is twice the bromine richness of Michigan brines and several times as rich as sea water. Advantages in the manufacture of bromine at Catesville is in richness, complete field operation by one company, absence of foreign water injection near the field, isolated nature of Catesville in regard to other Smackover fields, and excellent proximity of rail, road, fuel, and nearby city facilities.

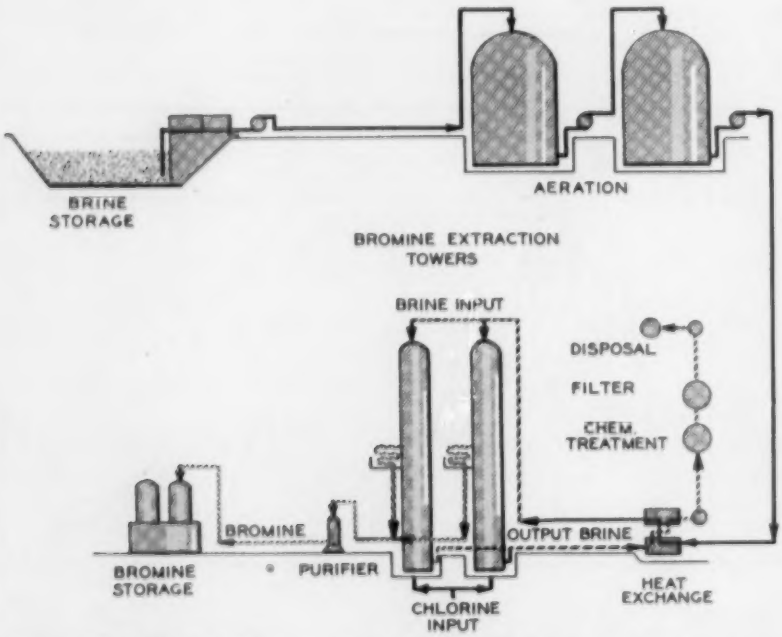
Production of Smackover brine averages about 1,200 bbl. daily from the four oil wells. Reda pumping equipment will be installed in some of the wells to provide the necessary brine for economical manufacture of bromine. The plant will start at 5,000 bbl. daily increasing to 9,000 later. With unit operations, great flexibility may be had in producing the Smackover or the Cotton Valley from a given well and depleted wells may be used for brine supply purposes in lieu of abandonment.

Process . . . Manufacture of bromine will be the same as universally employed. The brine will be aerated to remove the harmful gases such as H_2S and transferred through heat exchangers to the towers. The towers, made of granite, will take the heated brine at the top and pass it downward where the bromine will be displaced from the brine by chlorine. The bromine will then be passed off into collector coils, purified, and transferred into storage. Fig. 4 is a schematic diagram of the process.

Towers are generally operated in pairs and the Catesville plant will have four towers. The tail-end water will be neutralized, filtered, and pumped into a disposal well.

Following manufacture, bromine may be upgraded by further process and marketed as a compound such as ethylene dibromine. The Catesville plant will not upgrade the elemental bromine at the beginning. Plans are being made to refine and upgrade the bromine at a later date provided the process is economically feasible.

Economics . . . High bromine-content brine obtained at low production costs will allow the operation to be economical provided the bromine output is roughly 2 million pounds annually. The four-tower plant is expected to produce over 4 million pounds each year, thus requiring about 9,000 bbl. of brine daily. The plant is estimated to cost in excess of 1 million dollars and will require approximately 6 years to pay out.



BROMINE PLANT takes Smackover water produced from oil wells and extracts the bromine by means of chlorine. Fig. 4.

Acknowledgment

Acknowledgment is hereby given to Murphy Corp. for permission to publish this article.

QUANTITATIVE LOG ANALYSIS—2

Resistivity of Fluids

by Dr. R. G. Hamilton and Paul Charrin

Mud and Water Resistivities:

R_m: In many respects the column of mud opposite a formation may be regarded as a third bed involved in the measurement of S.P. or resistivity. It is essentially a 100 per cent water-bearing, shaly sand of high porosity.

The apparent values of all resistivity curves are influenced by the mud resistivity and must be corrected by departure curves for R_m as well as for hole diameter.

The shape and amplitude of the S.P.

The authors are, respectively, head of Hamilton Well Log Consultants, Tulsa, and president of Perforating Guns Atlas Corp., Houston.

curve are determined in part by the resistivity ratio, R/R_m. When the beds are thin and, or, highly resistive, it is necessary to correct the ASP to the SSP before this may be employed in quantitative analysis. The correction is for R_t/R_m or R_t/R_m.

R_{mf} and R_{mc}: The microsurvey curves are influenced by R_{mf} and R_{xo}. R_{xo} is a function of R_{mf} by the idealized equation: $R_{xo} = F \times R_{mf}$. Microsurvey curves must be corrected for R_{mc}.

The R_t value, usually obtained from a short normal spacing, is determined largely by the mud-filtrate resistivity and the porosity of the bed. The R_t value is given by the equation: $R_t = (F \times R_{mf}) \times C$. C is a variable related to the degree of invasion and the mixture of fluids in the invaded zone.

The SSP of a bed is a function of the ratio R_{mf}/R_w. When R_{mf} is relatively large, the S.P. is high. Conversely when R_{mf} is close to R_w, the S.P. of the bed is low. R_{mf} is required for the calculation of SSP from the S.P. equation.

R_w: R_w also controls the ratio R_{mf}/R_w, therefore determines in part the magnitude of the SSP. When formation waters are relatively saline, R_w is relatively small and the SSP is high. R_w is required for the calculation of the SSP of a bed.

The fundamental relationship: $R_t = F \times R_w/S^n$ demonstrates that the resistivity of a formation is a direct function of R_w. When formation waters are highly saline, R_w is small and R_t is a low value. Conversely, when formation waters are slightly saline, R_w is large and R_t is a high number. The resistivity of a formation is thus directly related to R_w, the formation water resistivity. In quantitative log analysis

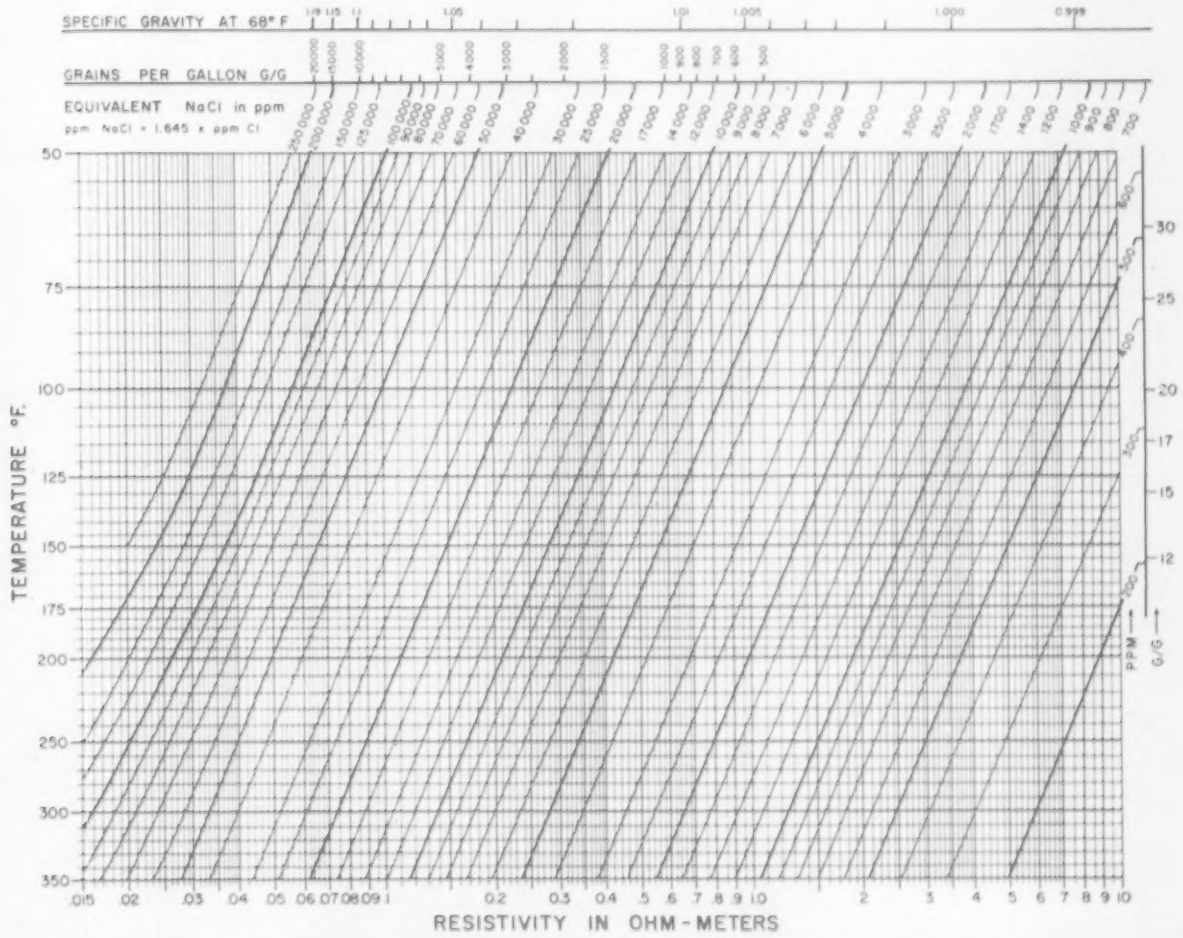


Chart 2—Resistivities of NaCl solutions as a function of temperature. Use this chart to adjust R_w, R_{mf}, and R_t values from one temperature to another or to determine resistivity from a chemical analysis.

one of the first steps is to determine R_w.

Summarizing, R_m, R_{mf}, R_{mc}, and R_w must be known with accuracy for quantitative determinations. They should also be considered when evaluating a log qualitatively. Chart 2 is employed for the determination of R_m, R_{mf}, and R_w at a given temperature.

Use of Chart 2

Since the fluids involved contain principally NaCl, Chart 2 for NaCl solutions may be used to determine R_m, R_{mf}, and R_w at various temperatures. P.p.m. NaCl is shown at the top of the chart. A new feature is the addition of specific gravity of solutions at 68° F. Also the grains per gallon have been plotted correctly for a temperature of 68° F.

The following table converts specific gravity and grains per gallon at 68° F. to values at other temperatures:

Temperature °C.	Temperature °F.	Correction factor
0	32	1.006
10	50	1.003
20	68	1.000
30	86	0.996
40	104	0.992
60	140	0.983
80	176	0.972
100	212	0.960
121	250	0.944
148	300	0.920

To adjust R_m, R_{mf}, or R_w from one temperature to another:

Given: R_m = 2.0 ohm-m. at 100° F.

Find: R_m at 175° F. — temperature opposite a bed.

Find R_m = 2.0 at bottom of chart. Draw vertical line to 100° F. horizontal line. Move pencil along the 2,000 p.p.m. line to the 175° F. line. From this intersection drop a vertical line to bottom of chart and read R_m = 1.13 ohm-m. Follow same procedure for R_{mf} and R_w.

Determine R_w from a water analysis:

Given: Chemical analysis of water, 100,000 p.p.m. NaCl equivalent.

Find: R_w at 75° F. Find intersection of 100,000 p.p.m. line with 75° F. temperature line. Drop vertical line to bottom of chart and read R_w = 0.073 ohm-m.

If the water contains ions other than Na and Cl, convert each ion to equivalent NaCl. Use total equivalent NaCl

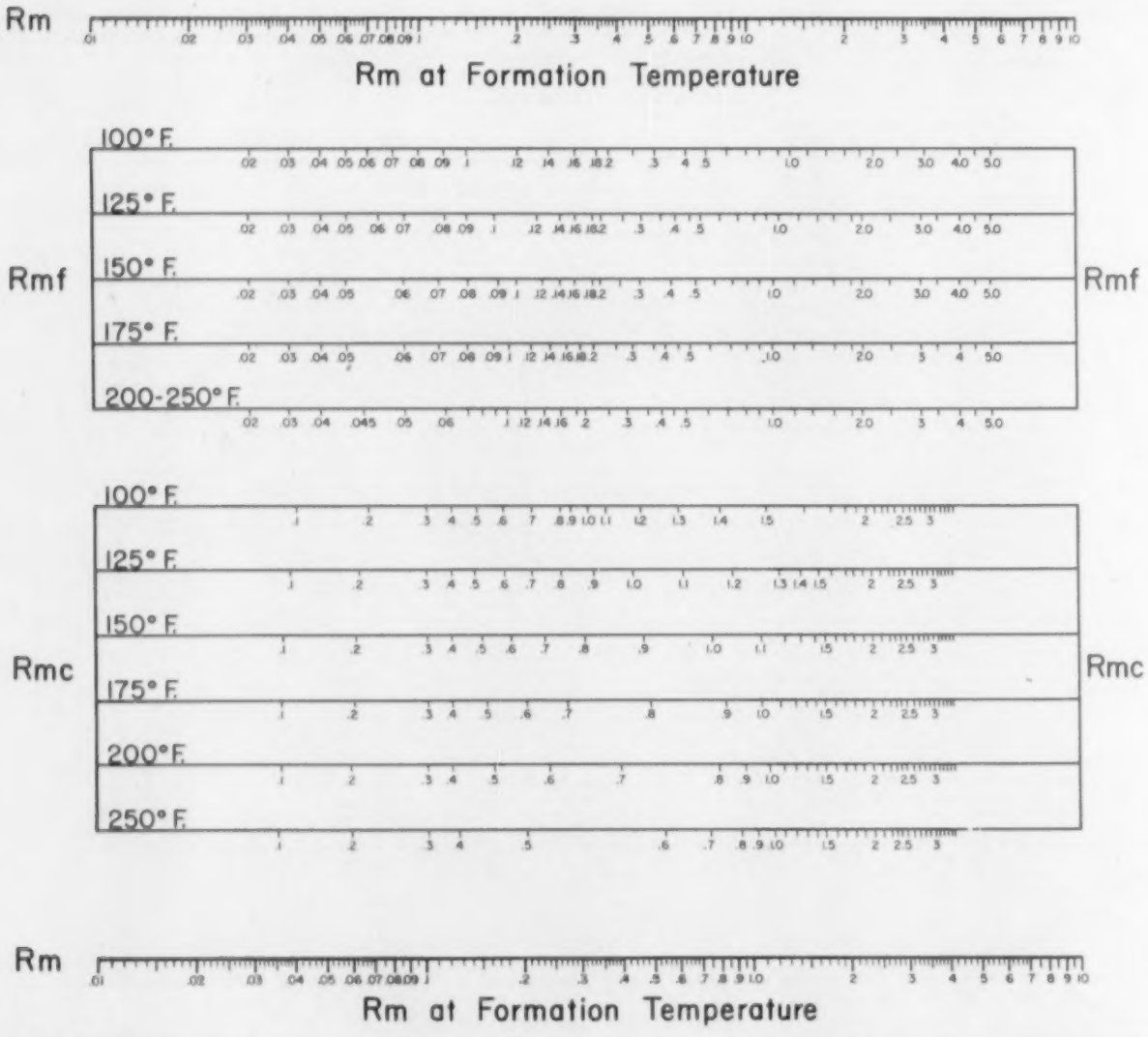


Chart 3—Relationship of mud-filtrate and mud-cake resistivities to mud resistivities. Place rule vertically across R_m at formation temperature and at same temperature read either R_{mf} or R_{mc}.

and proceed as above. For convenience the Dunlap[3] conversion factors are given below:

Ion	Conversion factor
Na	1.0
Ca	0.95
Mg	2.0
Cl	1.0
SO_4	*0.5
CO_3	1.26
HCO_3	0.27

*Average value.

To get p.p.m. NaCl from p.p.m. Cl: p.p.m. NaCl = 1.645 × p.p.m. Cl.

To get grains per gallon and specific gravity: Read direct opposite p.p.m. NaCl. Correct the values for temperature by above table.

Arp's resistivity correction approximation: A rapid approximation of resistivity of a solution at a given temperature when known at a first temperature is given by:

$$R_{t2} = R_{t1} \times \frac{t_1 + 6.77}{t_2 + 6.77}$$

Use of Chart 3

R_{mf} and R_{me} are required in the determination of Φ and F by the microsurvey method. R_{mf} for certain calculations in the S.P. equation and in some studies where R_i values are used.

Since muds are heterogeneous mixtures of electrolytes and solids, including clay minerals, the ratios R_{mf}/R_m, R_{me}/R_m may be quite variable for different muds.

R_m, R_{mf}, R_{me} may be measured on mud samples taken at the well at the time of logging. However, such measurements are not always available and statistical data relating the three parameters at various temperatures are employed.[4]

Chart 3 is a presentation of statistical data on one graph, making it possible to obtain, at a glance; R_{mf} and R_{me} at any temperature at which R_m is given.

For a rather wide range of R_m, $R_{mf}/R_m = 0.75$ to 0.8. The ratio R_{me}/R_m is more erratic. An approximation of R_{me} may be obtained assuming $R_{me}/R_m = 1.5$.

Probably the greatest source of error in the determination of Φ and F from well resistivity logs—when all other conditions are favorable—lies in the indetermination of R_{mf}/R_m, and R_{me}/R_m.

Note: List of references was published at the end of Part 1 in this series, in the issue of November 12, 1956, page 192.

BOOKS

THE WORLD'S TANKERS by Laurence Dunn. Published by Adlard Coles, Ltd., and John De Graff, Inc., New York. 170 pp. $6.95.

The need for ships to transport liquid fuels has risen with the growth of the petroleum industry. The tanker has evolved from a vessel of small size and often crude design into one of the best-equipped and highly developed types of merchant ship.

The author, a marine artist, includes drawings and silhouettes coupled with selected photographs in this new book. Purposes, developments, and features of tankers are ably described. Over 200 pictures are included complete with a concise history of the vessel concerned.

Diagrams, cross-sections, and drawings give ship dimensions and construction layout. The book is divided into 13 sections which include a history of tankers from pioneer days to the present.

MISSISSIPPIAN STRATIGRAPHIC STUDIES, BOTTINEAU COUNTY, NORTH DAKOTA. By Sidney Anderson and LaVerne Nelson. Published by North Dakota Geological Survey, Grand Forks, N. D.

The North Dakota Geological Survey announces the publication of Report of Investigation No. 24 entitled, "Mississippian Stratigraphic Studies, Bottineau County, North Dakota." The report provides a study of the formations of the Madison Group in Bottineau County. Three lithologic and electric log cross-sections are presented to aid in correlations. Sour subsurface maps are provided; these show (1) contours on the paleozoic erosion surface; (2) porosity of the 100-ft. interval below the Paleozoic erosion surface; (3) structure contours on the anhydrite near the middle of the Mission Canyon formation; and (4) thickness of the Spearfish formation which overlies the Madison group in Bottineau County.

INDUSTRIAL VISION by H. W. Hofstetter. Published by Chilton Co., Chestnut and Fifty-sixth Streets, Philadelphia 39. 181 pp. $10.

This new book illustrates the relationship of vision, visual testing, and visual skills to industrial performance, production, and safety. It is intended as a useful working reference for safety and personnel directors, illuminating engineers, and others who are directly concerned with industrial safety precautions, and visual welfare and testing.

An interpretation of vision is made in terms of visual acuity, extraocular muscle imbalance, color vision, stereopsis, and visual field anomalies. Included are charts, photographs, and diagrams on visual testing in industry, industrial eye hazards and protection, visual and industrial efficiency, industrial compensation, visual tests for driving ability, and other related material.

Complete in text and illustration material, this new book is a landmark in its field. Over 10,000 men and women permanently lose part of the vision of one or both eyes as the result of industrial accidents each year. These statistics more than justify this comprehensive analysis and review of industrial vision.

BIBLIOGRAPHIC SURVEY OF CORROSION. Published by National Association of Corrosion Engineers, 1061 M. & M. Building, Houston 2, Tex. 382 pp. Nonmembers N.A.C.E. $12.50, members N.A.C.E. $10.

Material for this book was selected from bulletins published by more than 30 abstracting agencies representing international literature coverage. Summaries of 3344 corrosion and corrosion-prevention articles, books, and brochures published in 1952-53 are compiled in this volume.

Abstracts are arranged topically according to the N.A.C.E. abstract filing index. This index divides the literature into eight main groups: general, testing, characteristic corrosion phenomena, corrosive environments, preventive measures, materials of construction, equipment, and industries.

The subject index, in addition to terms in the N.A.C.E. abstract filing index, lists many metals and alloys by trade name and indexes them as to specific properties and to behavior in specific media.

This is the fifth in a series of N.A.C.E. bibliographies on corrosion literature.

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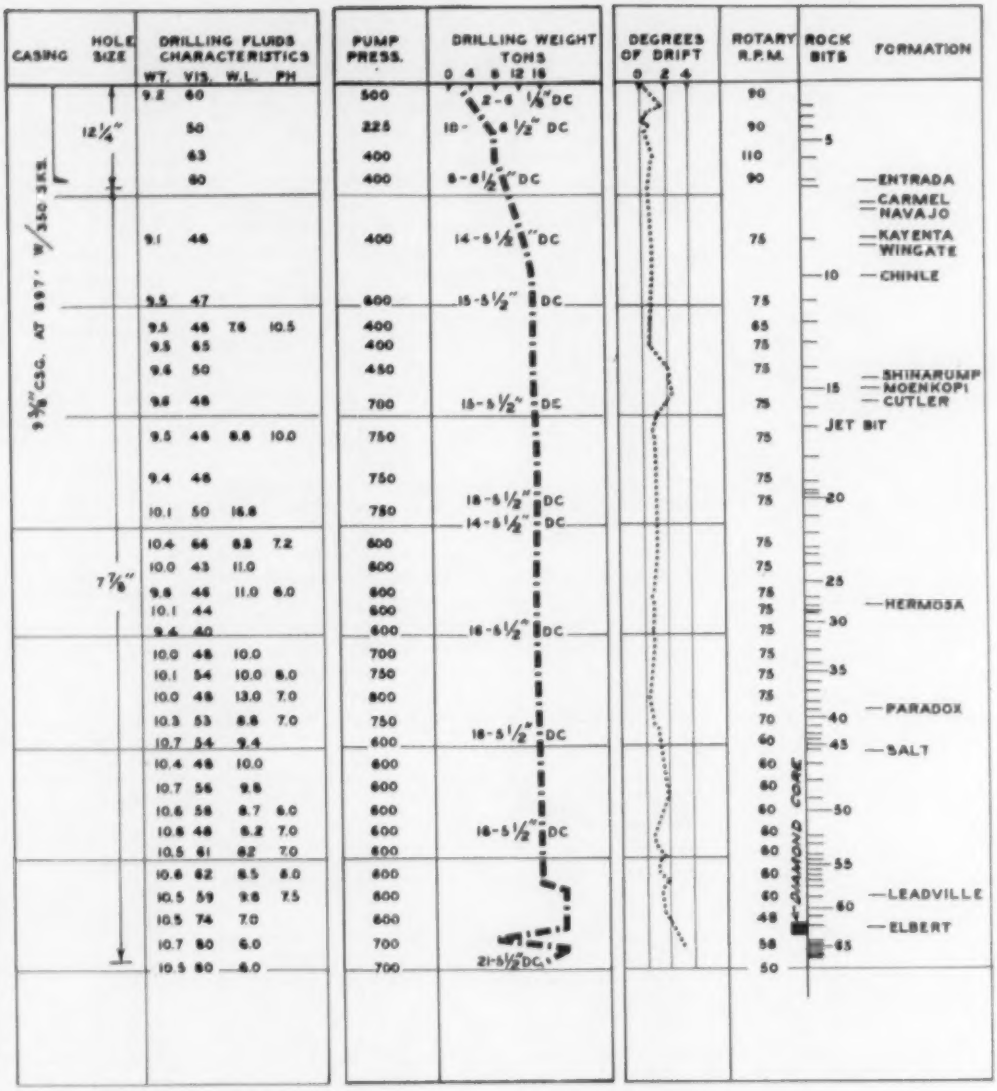
Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, Petroleum Refinery Consultant, Tulsa.

The Index was explained July 7, 1952 (page 105), as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

	Index (1946=100)					
	1949	1952	1953	1954	1955	Aug. 1956
Pumps, compressors, etc.	135.9	155.6	162.5	166.5	172.2	196.6
Electrical machinery	130.9	152.4	156.4	160.0	162.5	175.0
Internal-combustion engines	124.8	146.5	148.1	150.5	153.2	163.6
Instruments	123.1	146.2	151.8	154.6	162.9	181.9
Heat exchangers	133.0	165.8	174.9	171.7	156.8	197.8
Miscellaneous equipment average	*121.6	153.3	158.8	160.7	161.5	183.0
Materials component	143.6	164.3	172.4	174.6	176.1	195.7
Labor component	137.1	163.1	174.2	183.3	189.6	200.9
Nelson construction index	139.7	163.6	173.5	179.8	184.2	198.8

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.



HERE is how a typical Paradox wildcat was drilled. Most Aneth field wells are completed in the Paradox formation between 5,800 and 6,000 ft. (Data compiled by E. A. Polumbus, Jr., petroleum engineer, Denver.)

Paradox Basin Looks Good to Drillers

by Norman S. Morrisey
Drilling-Production Editor

DRILLING contractors are eying the Paradox basin as a new drilling area that is rapidly developing into an important oil province. The Aneth trend is already nearly 20 miles long. The basin has had eight discoveries in 1956, six oil wells and two gas wells. The future looks bright.

From the contractor's standpoint, only one obstacle prevents the rapid development of the known fields—lack of a pipeline outlet. But Northwest Pipeline Corp. has a pipeline planned for the Paradox basin that will handle 25,000 bbl. per day. Once this outlet is available, development drilling should reach boom levels.

Aneth alone will require at least 100 locations to develop the semiproved acreage outlined to date. It is too early to forecast the size of the Recapture Creek Unit or the new discovery at The Texas Co.'s 1 Navajo "J." The drilling outlook, however, is most promising, not only in these fields, but throughout the basin.

Drilling . . . Until recently, operators at Aneth were running intermediate casing, but they are now eliminating this string of casing. The 5,900-ft. wells may require as much as 60 days to drill and complete, because operators require as much as 18-20 days on day work, coring and testing. This time will be reduced as field development pro-

EXPLORATION

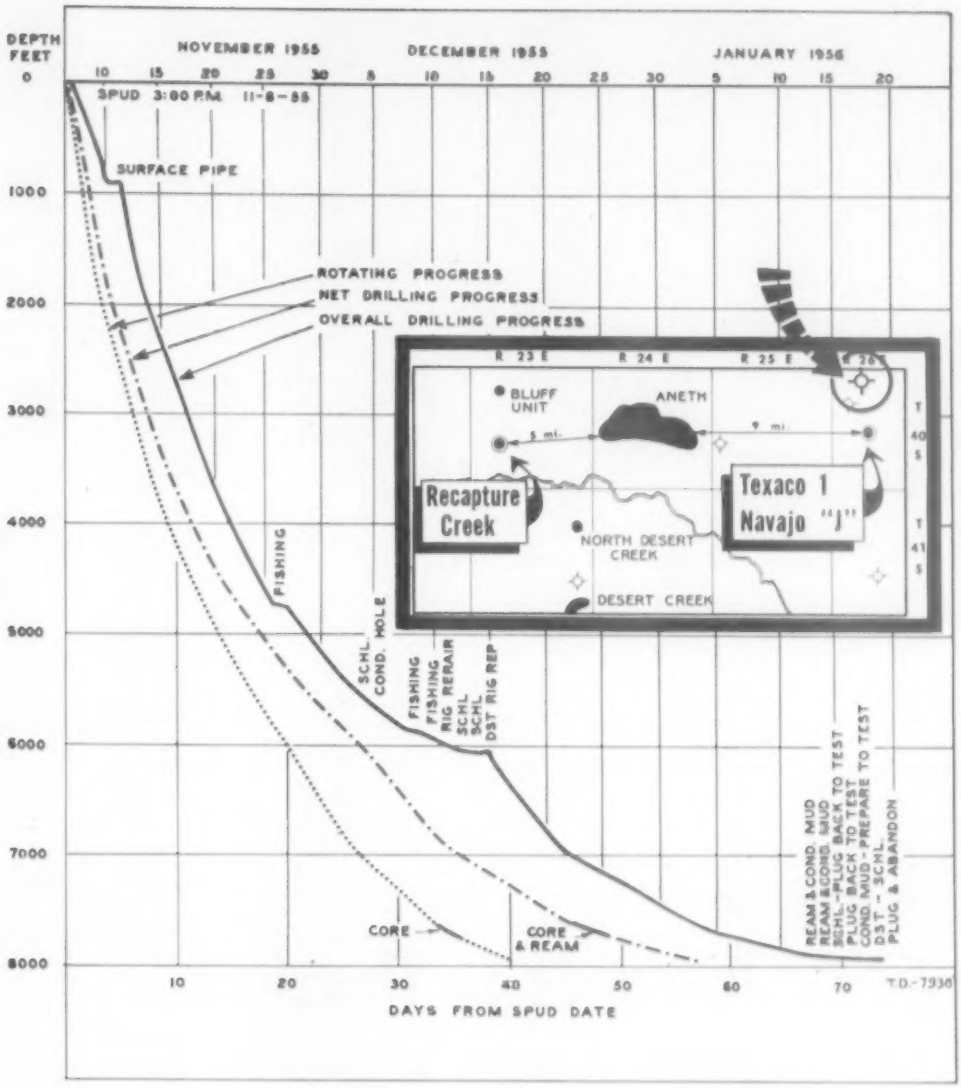


TABLE 1—MUD ADDITIVES
(Tabulated from Drilling Reports)

Barite, lb.	242,200
Salt gel, lb.	91,200
Bentonite, lb.	76,300
Starch, lb.	40,000
Gypsum, lb.	10,400
Preservative, lb.	6,458
Barium carbonate, lb.	1,650
Quebracho, lb.	1,150
Caustic, lb.	575
Sodium bicarbonate, lb.	500
Fiber, sacks	100
Lime, lb.	50

TABLE 2—TIME ANALYSIS
(From spud date to total depth)

	Days	Per cent
On bottom, normal trips, etc.	52.8	71.3
Coring and reaming (incl. trips)	4.0	5.4
Mechanical down time	1.1	1.5
Condition hole, mix mud	3.9	5.3
Electric log	3.4	4.6
Drill-stem tests	3.1	4.2
Fishing	2.0	2.7
Rig up on spud date	0.6	0.8
Casing (W.O.C., etc.)	2.1	2.8
Plug and abandon	1.0	1.4
Total	74.0	100.0

TABLE 3—BIT SUMMARY

Size (in.)	Drilling: No. bits	Footage	Ft. per bit	Hrs. on bot./bit
12¼	6	842	104	6.8
7⅞	62.7	7,997	128	14.1

Note: One 7⅞-in. bit used to condition hole.

Size (in.)	Reaming: No. bits	Footage	Ft. per bit	Hrs. on bot./bit
7⅞	0.3	99	330	23.3

Size (in.)	Coring: No. bits	Footage
7¾	1	99

gresses, since much of the coring and testing can be eliminated. Notice on the drilling curve shown that only 18 days were needed to reach the salt at 6,050 ft.

Contractors get $8.50 per foot with the day-work rate running $825 per day plus 1½ cents per foot drill-pipe rental, according to a recent survey. A typical field well requires as many as 35 bits.

Supply is a big problem, because the nearest supply center is at Farmington, N. M., nearly 100 miles away. Considerable time is lost when a breakdown occurs, waiting for a replacement part.

The drilling curve shown is from a wildcat that drilled through the entire Pennsylvanian section, bottoming in the Elbert formation at a total depth of 7,938 ft. The operator spent considerable time in coring and testing at this well. The well lies some 10 miles northeast of Aneth field, but only 2½ miles due north of Texaco's newly discovered oil field (1 Navajo "J," Section 20-40s-26e). Tables 1, 2, and 3 contain additional data on this well.

REFINING PANEL
A. A. Forter
Cities Service Refining Corp.
C. A. Hardcastle
Lion Oil Co., Div. Monsanto Chemical Co.
Carl Bochow
Suntide Refining Co.
Bruce Jones
McMurrey Refining Co.
Mark E. Houser
Republic Oil Refining Co.

MODERATOR
Harry K. Wheeler
Pan-Am Southern Corp.

In photo . . . Houser, Forter, Jones, Hardcastle, Bochow, Wheeler, Maddocks, McGregor, Haig, and Logwinuk.

ENGINEERING PANEL
D. W. McGregor
Lummus Co.
Dr. A. K. Logwinuk
Houdry Process Corp.
R. R. Maddocks
Blaw-Knox Co.
R. R. Haig
Esso Research & Engineering Co.
Dave Thornton, Jr.
Sitting in for J. G. Eckhouse, Universal Oil Products Co.

PANEL PONDERS, SUGGESTS SOLUTIONS, AS

Refiners Seek Answers to Puzzlers

W.P.R.A. regional meeting at El Dorado is featured by lively question-answer session

As reported by Larry Resen, Journal District Editor

1. Alkylation

Q. What is the effect of isobutane-olefin ratio on yields and performance number of light alkylate in a sulfuric acid plant, and what is the yield of heavy alkylate? How can the yield of heavy alkylate be minimized?

A. Generally, a high ratio of isobutane to olefin will result in higher yields and higher performance number of light alkylate. With this in mind, at McMurrey Refining we try to have a minimum ratio of 5:1 isoolefin. We also try to keep 50 per cent isobutane in the effluent stream for best conditions.

Over-all, we pay attention to one very important operating variable. This is acid consumption. If you have a low acid consumption you're probably maintaining reactor conditions best for light alky yield and performance number. Of course, temperature is quite important. Our reactor is held to a maximum of 50°. It would be preferable to get it lower, say 35°-40°, but day-to-day we aim to keep it below 50°. With the high isobutane content, low temperature, and with low acid consumption in mind, polymerization and neutralization will be minimized and the yield of heavy alkylate reduced. You can get yields of heavy from 5-6 per cent of total alkylate with good operating conditions.

Incidentally, it might be good to mention feed stock here. A charge of predominantly B-B feed will be better than one with high P-P or amylene content. We are not qualified to make any specific statements about amylenes, but we have operated with P-P feed as high as one-third of total olefins.

Q. In Kellogg type of reactors, what is the effect on yield and performance number when varying the percentage of B-B feed to the various stages?

A. At McMurrey we haven't varied to any great extent. We have five reactor zones and generally charge 20 per

JACK EPPARD . . . "Sunray Mid-Continent treats alkylation reactor effluent by passing through bauxite towers."

GENE NORRIS . . . "Houdry has compiled some interesting cat cracker data."

MARVIN PARK . . . "At Pure Oil we did find a change in product distribution. Our B-B's were up and our P-P's down."

cent olefins to each one. We will vary slightly to balance refrigeration. Other things being equal, we feel the equal division of feed will result in higher yields and performance numbers.

If you did double the B-B charge to one zone and had the others equal, you'd probably run into undesirable reactor conditions, especially in the first zone or two. First of all, you would have a low internal isobutane-olefin ratio and then you would overload the refrigeration system in the first zone. Your quality would be off and you would probably have an increase of side reactions in the first and possibly second zone.

We did have an unusual situation occur at McMurrey. While starting up the unit, we were temporarily limited in power, and hence ran only three of the five mixing zones. We found that we had to run only the last three zones, otherwise there was high polymerization taking place and resultant plugging. This, of course, was a temporary experience.

Q. What tests are used to determine the effectiveness of a caustic wash when treating reactor effluent from a sulfuric acid alkylation plant? Will the use of a caustic wash, water wash, and organic inhibitors reduce the fouling in a deisobutanizer preheater and transfer line to the deisobutanizer?

A. Some people use the A.S.T.M. distillation flask char test. The flask is heated until all the liquid evaporates, and the residue is determined. This actually determines the increase of the esters over a period of time. Care has to be taken to use perfectly clean flasks and to move precise measurements.

At McMurrey, we use the A.S.T.M. test periodically. Primarily, however, we check the differential in alkalinities, using phenolphthalein and methyl orange. When the percentage difference increases by one, we dump the caustic. This usually occurs every 3-5 days. We feel that in caustic carryover there is a correlation with the buildup of neutral salts. There is not acid carryover or acidic esters per se. It is the presence of the salts which renders the treating ineffectual. Actually, the decrease of alkalinity in the system is slight.

Another test followed is to continually check pH in water wash, and when it gets above 9.5, dump the caustic.

On the unit at McMurrey, studies were made using various inhibitors. Plugging up of tower trays was experienced, with the plugging being due to products of corrosion. The corrosion resulted in turn from decomposition of esters into sulfur dioxide. We had a low pH on overhead of the deisobutanizer and on the bottoms of the rerun tower. We have found that injection of 5-10 p.p.m. of a water dispersible filming amine into the overhead of the deisobutanizer, debutanizer, and rerun towers has helped a great deal. Monoethanolamine meanwhile is also added to the feed.

Interestingly enough, we had occasion to install admiralty-metal tubes in reboilers. Regular tubing wasn't immediately available at the time and this was used. Much to our delight, we've been able to operate 9 months so far with these tubes in use. We also have a spare bundle on hand. When plugging occurs, we take time out to replace the bundle, which can be done quite rapidly, and then go back on stream.

Q. What has been the operating experience in treating sulfuric acid alkylation reactor effluent with absorbents?

A. Sunray Mid-Continent has been treating reactor effluent at the West Tulsa refinery. Bauxite treaters have been used and are taking out a lot of materials which previously had been giving trouble down the line. No one is here to give specifics on the setup, but it is generally felt to be quite successful, although there is still some fouling of rerun boilers.

Q. Are refrigeration and mixing both being utilized in new HF alkylation units? If so, what is the effect of this mixing on the product quality and yield on both aviation and motor alkylate? How does this affect economics?

A. In some units, those of U.O.P. design, there is mixing being used to some extent, but not to the degree in sulfuric acid units. In most of the units, however, only water cooling is used. There should be some advantage with refrigeration and some conversions have been done to do this. However, the area is not well defined and we don't know economics on the setup.

Q. What are the specific benefits to be obtained in using refrigeration on HF units?

A. There are just general reports but there does seem to be some good

obtained when charging B-B only. There is no detailed information. The work in the past, however, is pointing in this direction.

Distillation, Thermal Cracking and Coking

Q. What is the maximum allowable superficial vapor velocity for vacuum towers used to produce gas oil for catalytic cracking charge? Are mesh blankets being used above the flash zone in vacuum towers to reduce entrainment due to high velocity? If so, what experience has been encountered with plugging of the blanket with coke formation?

A. This is a broad subject and from the process design setup, it will depend on the type of tower, whether bubble-cap, etc., whether wet or dry, and so on.

The general equation for calculating vapor velocities still applies in vacuum distillation. In designing a bubble-cap tower, we thing of the cross-sectional area of the tower. It is not quite the same where shower decks are used. The transfer area here might be the vertical area between two plates in the center of the tower.

In general, the rate is 50 bbl. per day per square foot of tower area. In the case of shower decks, the diameter of the tower required is 20-30 per cent less than with bubble caps. The equation holds for both wet or dry under usual conditions.

In an article in The Oil and Gas Journal (November 7, 1955, page 103) Cosden's experience with a mesh blanket was described. They had plugging take place which required periodic shutdowns. A gas-oil wash system over the blanket was used to solve the problem.

Other plants have experienced the same condition. However, considerable controversy exists over whether to use a gas-oil wash or not. In designing a tower, it would probably be best to put in a wash system. If you found it undesirable, you could always cut it off.

Some units have a reflux system installed. This, of course, cuts down on the volume but also cuts down on the "gunk." This will not do the trick if you're going to asphalt bottoms, however.

Q. What is the effect when injecting steam in coking unit furnace tubes on coke deposits? Does this aggravate foaming in the coke drum? What can be done to reduce foaming? Has anyone used antifoam agents?

A. For the effect of steam you should refer to one of W. L. Nelson's early texts. He had a plot which correlated radiant rate and fluid velocity against coke deposition. From the plot it is seen that it is desirable to have a high fluid velocity and low radiant rates. The purpose of the steam is to get the high velocity.

We can't say whether steam has an effect on foaming in the coke drum. This foaming can be reduced with agents. At Blaw-Knox, we're not familiar with these, but do know that Standard of Indiana has had some experience with them. We have learned that a reduction in temperature will usually cause a reduction of foaming in the coke drum.

Q. It is understood from last year's meeting that some companies intended to try water injection on their thermal units Did they do this and what were the results?

A. Sunray Mid-Continent injected water into coils close to the inlet to increase velocity through the tubes. This did minimize coke laydown and coking up trouble which was experienced previously. Incidentally, the steam capacity was limited and hence water was used rather than steam.

Cities service looked into water injection into the dissipater coil. The water was injected and velocity in the tubes increased. However, it was necessary to go up in temperature and some coking was experienced.

Apparently there is a critical temperature where coking will be accelerated even with an injection system. Generally this is around 700°-800° on different units, if you exceed it, then coking will really take place.

Standard of Ohio had an interesting experience with a chemical desalter. The unit was running a pH of 9.5 on its outlet. With this condition, there would be a laydown in the tubes in the coker-heater. The laydown consisted of alternate layers of black and white material. The black was coke, and the white had a high percentage of caustic present. The pH of the outlet stream was adjusted downward to 8.4 and with this change, the unit achieved its desired 6-month run. Apparently caustic seems to accelerate coke production.

Q. Did someone have an additional comment on antifoam agents?

A. Yes. Ohio also has had some interesting results using DC-200 in the top of the coker drums to reduce foaming.

A solution consisting of one-third of the silicone and two-thirds coker lean oil is injected into the drum when the foam gets up to the 7-ft. outage point. It is added at the rate of 95 cc. per minute.

Q. You mean you don't inject it continuously?

A. That's right. When the level in the drum is low, there is no problem, but as the drum fills, foaming would cause carryover. Hence, we inject it only when the drum is fairly full. There's another point I'd like to mention. When the silicone was first tried, it was injected into the top of the drum, but would be carried over with the vapor. We found a convenient thermocouple point farther down and injected it there. We've had good success with this setup.

2. Fluid Catalytic Cracking

Q. What factors affect the CO_2/CO ratio in cat cracking?

A. It is hard to pin down anything definite on this. Catalyst is a definite factor—you will get different results when using synthetic types or when using natural catalysts. Temperature effects start at the point of combustion. However, you measure elsewhere and you get different results, mainly due to other effects, such as afterburning. In tests Esso made, differences were noted in different plants using the same catalyst and same supplier. This difference varied as much as 1.0 to 1.5. The catalyst was used in a pilot plant and differences were still noted. Variables such as air and temperature were changed but no definite correlation came out of the pilot plant.

Q. With regard to coke and gas factors on fluid cracking catalyst:

1. What metals are particularly bad actors?

A. Nickel and vanadium are the worst, with iron also a big problem child. Iron scale doesn't seem to be near as bad as iron contained in the feed stock. This is due to the feed impregnating the catalyst and being therefore much more effective as a poison.

2. Can the factors be reduced or eliminated by other than catalyst discard?

High quantities of steam are helpful, but the best approach is to keep all metals out of the feed stock. Vacuum distillation is quite helpful in this regard.

3. Are there any accepted short-cut methods that may be used for analyzing catalyst for these poisons?

X-ray is available but not necessarily quick or cheap. A good guide is

Dowell engineers at remote controls of three Allison powered pumpers during high-injection-rate fracturing treatment.

Aircraft power for faster injection

High-injection-rate fracturing provides better distribution of sand and treating fluid throughout the pay section. This means increased drainage area and a slower production decline. To give you the injection rates you need, with less equipment, Dowell now offers a new pumping unit powered by the famous 1500-h.p. Allison aircraft engine. Pound for pound, this unit delivers more horsepower than any other pumper in the oil fields.

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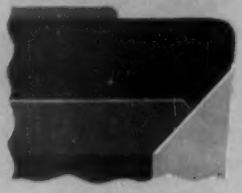
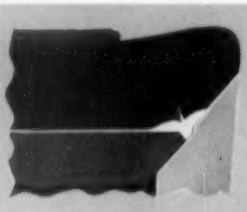
These comparisons show why
Mission Mud Monarch Valves
last far longer than conventional valves.

CONVENTIONAL



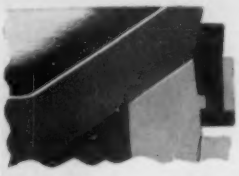
Conventional valves use a sealing element that seals at an angle, usually in the same plane with at least part of the striking surface. This arrangement works well when the valve is new and when pump pressures are low.



With wear, however, an opening forms at the junction of valve body, seat and sealing element. Pump pressures force part of the rubber sealing element into this space and it is pinched off. The result is short life for both sealing element and valve.

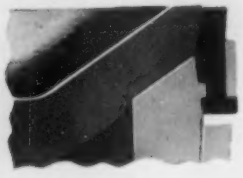
MISSION MUD MONARCH

NEW



With Mud Monarch Valves, the valve body strikes against the entire inclined surface of the valve seat, and the near-vertical seal ring seals against the outside diameter of the valve body. With this design, seal ring life is independent of valve and seat wear.

WORN



An opening can't form next to the seal ring even though the inclined striking surfaces of the valve and seat are worn. Both valve and seat wear longer before they need be replaced and seal ring life is increased substantially.

Mission Mud Monarch Valve

No other valve can give as much trouble-free service as a Mission Mud Monarch because no other valve has a sealing element that is unaffected by valve body and seat wear.

Mission Mud Monarch Valves are guaranteed to out perform any other valves you may be using, or your money will be refunded. Ask your supply store to arrange with the Mission Representative in your area for a competitive test in your pumps right away.

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Liners • Gland Packings • Slips • Swabs • Centrifugal Pumps • Plug Valves

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the hydrogen content of the tail gas. If it climbs, start to worry and check the feed and other points for corrective steps.

4. What is the actual plant significance of coke and gas factors above 2.0?

It means there is more gas and particularly more hydrogen present.

Q. Has anyone had any experience with a continuous catalyst addition system in the range of 0.5-1.0 tons per day? How did it affect the operation of the unit, as well as catalyst consumption and activity?

A. Yes, there has been some experience. Continuous addition will result in more efficient use of fresh catalyst. You avoid slugs with the attendant high loss of fines. You also avoid unit upsets from high activity immediately present after slugging the catalyst to the unit. Esso uses a system developed by Ketjem Co. in Amsterdam and this design is probably available for the asking without any royalty involved. This system is used on its smaller units. Esso has its own design for larger units.

Anderson-Prichard has a U.O.P. unit with an additional system which works very well. A 5-ton hopper is situated on scales and used to determine rate of addition. The smooth even rate is reflected all down the unit and works very well.

Q. What criteria are used in sizing strippers and spacing the intervals?

A. This is a complicated problem and is one which is still being worked on. As you know, strippers have two functions. One is to displace entrained vapors. The other is to remove oil from the catalyst particles without forming more vapor.

The first part, removal of the entrained vapors, isn't too difficult to determine. The second is more complex, since the holding time has to be determined and this will depend somewhat on the gas-oil ratio. The point is to hold the catalyst in the stripper long enough to remove all of the entrained vapor but not long enough so that more vapor is formed.

A good catalyst flow rate to aim at is 700 lb. per minute per square foot of area. You can use a moderate type of baffle to cut down the area about 50 per cent.

Q. What heat-transfer rate is obtained for a catalyst cooler immersed in a fluid-catalyst bed when used as a boiler and when used as a steam superheater?

A. A good reference on this is a brochure put out by Babcock & Wilcox. In it they refer to an article on CO boilers by Campbell, of Sinclair. In this item they came up with test data which shows the rate to be around 72 B.t.u. per square foot per °F. They realized an over-all rate of 24,000 which is quite good. There was an article in Industrial and Engineering Chemistry in 1949 which reported that results in the range of 40-90 were found from experiment.

Q. Is there any experience with the use of blocked-off steam tubes in this type service?

A. Recently Ashland put in a cat cracker and was using the tubes in the waste-heat boiler system for preheating water. Its steam facilities were not quite completed and it ran with some tubes blocked off with no difficulty.

Q. Has anyone done feed-line cracking? If so, what are the comparative yield advantages over bed cracking and how does the stability of the gasoline and heavier products compare?

A. At Suntide we have a U.O.P. unit and feel that we do have feed-line cracking with the reactor acting more as a disengaging zone. With the cracking taking place in the dilute phase there is less carbon laydown.

Humble has installed a transfer line reactor on a Baytown unit and has collected a lot of data but will not comment. Unofficially the results are said to be pleasing.

Q. Regarding the differences between low and high alumina catalyst, what is the effect on the following: Product yields? Contamination resistance?

A. At Suntide the switch was made from low to high alumina about 18 months ago and we are very well pleased. It might be noted that at about the time we made the switch, we were also going up on preheat temperature and increasing charge rate. We have noted the following:

1. A very high activity has been maintained with less destruction by steam.

2. A definite decline in catalyst loss. The initial decline was sharp and now catalyst loss has leveled off at a nice rate. This might be due to the low attrition rate on the catalyst.

3. The air rate dropped off a large amount. Apparently the coke laid down tends to burn off easier in the regenerator. Hence we now burn more coke with less air.

4. We tried to determine a product distribution difference but could not find any appreciable change.

5. There was also a drop in the CO_2/CO ratio. It dropped down from 1.15 to 0.95-0.98, and now has leveled off about 1.0.

A. At Pure Oil we did find a change in product distribution. It wasn't with respect to gasoline, however. Our B-B's were up and our P-P's down.

Q. At Pure we ran into a slightly higher regenerator temp. Our CO_2/CO ratio also came down from 1.1 to 0.95. Has anyone had this problem and done anything to reduce the temperature?

Q. Wouldn't the fact you're burning more coke account for the temperature rise?

A. It would to a slight extent, but we have an Orthoflow unit which is a balanced unit.

A. Suntide has had the problem of temperature rise. We may go up on our preheater to boot. We have been thinking of putting in steam coils in the catalyst cooler.

Q. What are your temperatures?

A. In the dense phase 1,175° F; dilute phase 1,190° F; stack, 1,220° F.

Q. Why are you increasing preheat if you have a temperature-rise problem?

A. We're pushing the unit hard and are circulating so much catalyst we have to go up on preheat.

Q. Does anyone preheat feed through regenerator coils?

A. You might have a coking problem if you do. People generally are reluctant to put in the feed at the temperatures found there. Some units have had external preheaters on the regenerator, but these were removed for safety reasons.

Q. Has anyone determined whether its necessary to maintain the U.O.P. weight activity higher with high alumina to get the same results with low alumina? At McMurrey we have felt it necessary to carry four units higher activity to do the same job. We have an over-all less catalyst cost, but still need the higher activity. The question resolves into what is "effective activity?"

A. At Suntide we've had a far greater difference than you've mentioned. We are now running with an activity of 40 where before we ran at 30. The manufacturers say they are now running correlations.

Q. What is your catalyst consumption rate at Suntide?

A. It is between 0.1-0.2 lb. per barrel. This has been brought down from a very high figure.

Q. Did you have some additional comments on cat cracking?

A. Yes. I'd like to make some general comments based on Houdry's experience:

First off, I'll have to note that Houdry's experience has been primarily with pelleted catalyst.

In respect to CO_2/CO ratios, we've noted that when using a natural-clay catalyst the ratio runs about 3:1. Synthetic catalyst will run about 2:1 or slightly under. Some work was done in the lab where conditions and results were quite consistent. Other tests were made in the plant and results weren't quite so clear due to factors such as afterburning.

On afterburning it might be well to note that it can be set off by presence of very fine particles. There is a lot of afterburning taking place after gas disengages in the bed. The tests run on the unit will vary due to this.

After our experience with Houdresid, we feel that metals are not necessarily bad actors. The metal factor can be considerably reduced or eliminated on pelleted catalyst. One unit ran an entire year on nothing but a topped crude charge.

A short-cut method for testing for contamination is to check the gravity of the tail gas off the unit and increased hydrogen can be determined this way. In the lab spectrographic analysis can be used.

Continuous addition of catalyst seems to be the best according to observations we've made. You don't get an unbalanced activity as you would with a slug of fresh catalyst and hence you maintain over-all balanced conditions.

Q. What is the effect on dry gas and butane distribution of the following variables? Temperature? Cat-oil ratio? Space velocity?

A. Assuming constant conversion, an increase of temperature will increase the dry gas and increase the unsaturated content of the C_3's and C_4's. Not much effect will be found on C_2's. Cat-oil ratio effects are not evident, and an increase of space velocity will have not appreciable effect.

Q. To what current maximum temperature are regenerators now being operated? Would this maximum temperature be different if carbon-steel cyclones are utilized? What are the design regenerator temperatures on new units?

A. Esso likes to keep the temperature down to minimize afterburning and aims at 1,100° F. as an ideal. However, if the unit is at a maximum circulation rate, it is better to go to a higher temperature than take a loss in conversion.

It might be interesting to know that we're putting in 18-8 clad cyclones in all units. However, the purpose is to avoid oxidation rather than our concern of metal failure or warping due to temperature. We're also using 18-8 in the plenum chamber. You can attain maximum temperature conditions with this steel, well above 1,200° F. if you wish. Of course, you have to keep in mind the problem of afterburning.

Q. Grid errosion is a problem. What is the best grid design to minimize erosion? Is a 2-psi. design pressure drop too high for a Model IV unit?

A. Esso strongly recommends the 2-psi. drop to get better regeneration. Naturally, we're also pleased to recommend Model IV design as a means of getting away from erosion problems.

A good suggestion to avoid grid erosion is the inclusion of alloy inserts in the grid holes. Colmonoy metal has shown up to be very good in this service. Its a little more expense to use the inserts, but you realize high benefits. You cut down on erosion problems and get better efficiency of your unit through better feed distribution.

Republic has a U.O.P. fluid unit of wartime design, and was experiencing bad erosion in the regenerator. This was eliminated by putting in a riser slotted at the top.

Q. On Esso's practice of using 18-8 on the cyclones, do you use it on both stages?

A. No, just on the primary stage. The secondary cyclones are unlined.

Q. What is the effect of preheating the feed to the F.C.C. converter to 400° F. and 750° F.

A. First remember that there are two reasons for increasing preheat: (1) If the unit is at maximum burning rate and you want to increase feed, and (2) to increase reactor temperature.

Effects are as follows:

1. You get a reduced catalyst circulation rate and higher regenerator temperature.

2. Carbon production falls since you will get less conversion from the lesser catalyst circulation.

3. Burning rate will also fall and you will get the regenerator temperature to drop back down somewhat.

4. You should get better stripping at these temperatures with less occlusion of feed on the catalyst.

5. A higher yield of products should result although general product distribution will remain about the same.

A. Sunray added a second preheater and finds less coke laydown. There hasn't been any change in product distribution.

Q. What are the comparative product distributions when cracking virgin, cracked and coker gas oils?

A. Some results are available on a Kuwait stock. The material which was cracked was somewhere between virgin and gas-oil in cracking qualities. It and coker gas-oil were cracked to the same severity at essentially the same conditions. The results are as follows: the virgin stock will give about 25 per cent more C_5's and gasoline than coker gas oil. Butanes will be about the same for the two stocks but dry gas will be up about 25 per cent with coker gas oil. Coker gas oil will lay down about 60 per cent more coke than the virgin stock.

In another test, coker gas oil resulted in about twice as much C_2's and lighter as with virgin gas oil. Coker gas oil had a reduced gasoline yield of about 25 per cent. Coker gas oil yielded 1½ times as much C_3's and about 1.1 times as much C_4's as virgin gas oil. These data are based on correlations. It hasn't been possible to charge the unit being observed with 100 per cent virgin or 100 per cent coker gas oil.

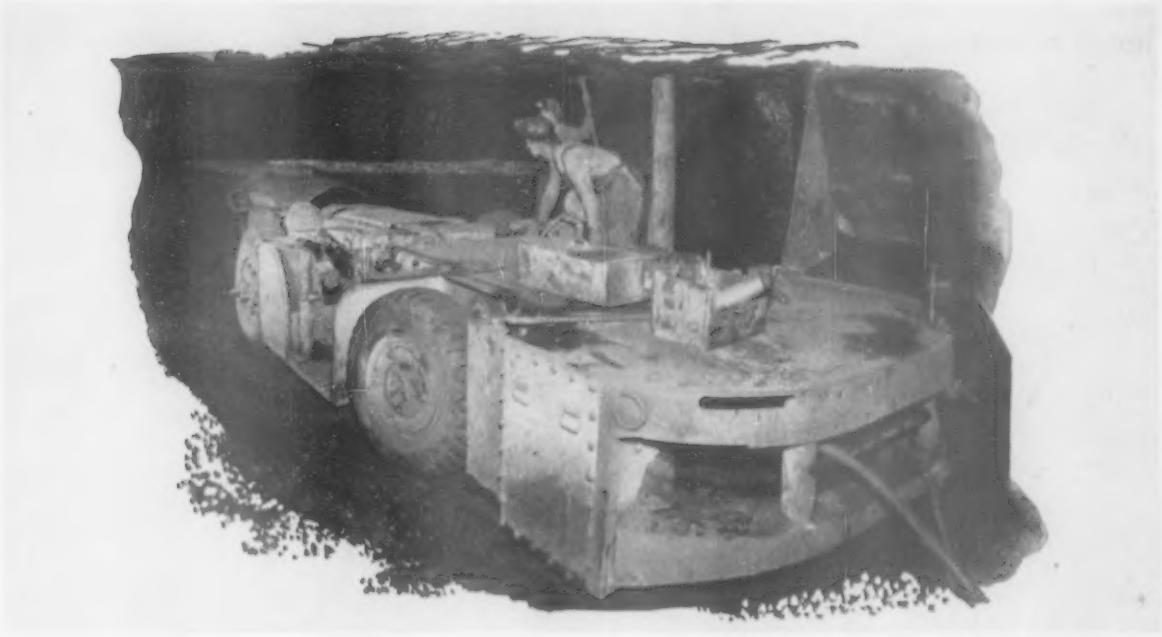
Q. Does anyone have any correlation with carbon residue? We've had a Conradson carbon result of 1.1-1.2 with coker gas oil.

A. You can make a pretty clean gas oil with Con Carbon running 0.2-0.3. Generally coker gas oil will have less hydrogen, yield more olefins and lay down more coke.

Q. Are corrosion inhibitors being used in F.C.C. gas plant systems? Where and how much?

A. Lion had been experiencing corrosion in the vapor-recovery system in the deisobutanizer overhead condenser. After investigating it was decided to use a water soluble inhibitor. Water is used as a control and the inhibitor is diluted 10:1. The solution is added into the overhead condenser line to provide 10 p.p.m. After using this, a check of the iron content showed a reduction from 1,500 to 100 p.p.m. The condenser hasn't been opened, but we feel the inhibitor is giving a great deal of protection.

(Continued on page 114)



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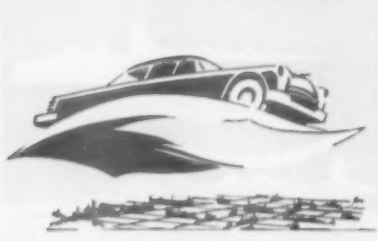

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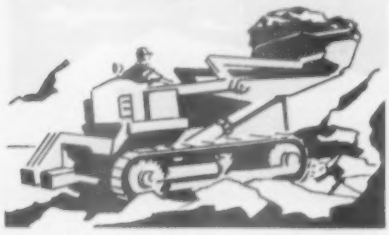

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Q. Are there any advantages to operating blocked out on virgin and heavy recycle gas oils? What would be the expected difficulties?

A. There are different opinions on this but generally it is hard to find any particular advantages. No operating difficulties should be expected.

Q. Would the answer be different if the recycle gas oil were hydrogenated and how do the yields compare between hydrogenated and raw gas oil?

A. You will find quite a difference as a result of hydrogenation. Generally the hydrogenated gas oil will result in 10 per cent less P-P, 10 per cent more B-B, 6 per cent more C_5's through 400° e.p. product and 25 per cent less coke laydown. You'll also find a better lead susceptibility of your gasoline. While unleaded stock will remain the same at 92-92.5 octane, the leaded stock will be 99.5 as compared to 97 without hydrogenation. Part of this is due to removal of the sulfur. These are some observations Houdry has made.

Esso has found an increase of 3 per cent more naphtha on the feed with about the same amount of fuel oil. Although there are other factors to consider, hydrogenation of recycle gas oil will result in credits of from 40-60 cents per barrel.

Q. What is the commercial experience on the effect of catalyst particle size, in terms of average particle size or percentage through a given screen size, on catalyst regeneration?

A. Republic has found that unless the percentage which will pass through 70 mesh is above 50, then you'll have regeneration difficulties.

Q. What is the magnitude of increased gasoline yield from substituting recycle for space velocity, holding conversion and other operating variables constant and operating in the 65-70 per cent conversion range?

A. Here are some results Houdry found operating on East Texas gas oil at 900° F. and 70 per cent conversion; results are compared to operating on no recycle.

	C_5's	C_4's	Dry gas	Coke
½-1 recycle	up 5 per cent	down 6 per cent	down 8 per cent	down 10 per cent
1-1 recycle	up 12 per cent	down 12 per cent	down 15 per cent	down 20 per cent

Q. What regenerator lining is now felt to be the most satisfactory? If hex steel is used is alloy better than carbon steel?

A. Generally the monolithic lining using hex steel is best. Esso has also gone to 18-8 alloy in all new linings to reduce the oxidation problem. Foster Wheeler has made a study on regenerator linings which should be of interest to all concerned.

Q. Let's consider catalytic cracking of over-all feed stock prepared in a refinery having a vacuum feed-prep unit. What are the effects of excess kerosine distillate in the feed stocks on: (a) The amount of cracking of the kerosine distillate, and (b) octane numbers as compared to 100 per cent "wash-through" of kerosine distillate?

A. The effect is immediate, and if you're aiming for octanes, keep it out of your feed. An accidental inclusion of some in feed stock resulted in poor gasoline quality on one unit. You'll get different effects on fractionating gasoline. The lighter cut is not too affected, but the next two lower cuts will be hurt, although data on the extent of the harm are not available. If kerosine is in the feed stock, you'll have to increase severity on the unit to maintain quality.

A good i.b.p. on feed stock to the cracker is 475° F. minimum. A drop to say 440° F. might cost you as much as 1½ octane numbers.

Q. Has anyone used a diluent to get away from the effect of high carbon feed?

A. Some plants keep a line available for injecting a diluent into the feed at any time necessary. The diluent sometimes is kerosine.

At Cities Service we have three cat crackers, and one is used as a heavy oil unit. To avoid high carbon buildup we use about 16,000 bbl. of light virgin gas oil or cat recycle oil in the fresh feed. Total fresh feed is about 40,000 bbl., of which 10,000 is gas oil and the balance of 14,000 is heavy gas oil.

Esso has seen some drastic times when it has been necessary to cut feed entirely and throw in a naphtha feed. This way you can get your heat out without carbon buildup. It is more of an emergency measure when you're in a bind.

Q. How light a feed would you recommend?

A. A heavy naphtha. Again, its drastic but effective.

Q. Wouldn't you upset your fractionation system?

A. There's no doubt you'd get that effect, but it's more important to get rid of the carbon buildup. Incidentally, you can't use too light a hydrocarbon feed because of the high pressures you would run into.

A. International Refineries had a heavy carbon buildup and tried to reduce it by using a light feed with no effect. It was thought that the added carbon on the catalyst was simply acting as an absorbent and actually carrying more oil into the regenerator this way, thereby reducing the amount of carbon burned off, in effect. Finally, we shut down the unit just to burn off the carbon.

Q. Wouldn't the use of naphtha have enabled you to get the carbon out faster than just a plain shutdown with burning?

A. We didn't have the naphtha available, so we just shut down and burned away.

Q. What means can be used in handling F.C.C. light cracked distillate besides selling as fuel oil?

A. At McMurrey we don't crack 100 per cent light cycle, but a mixture of about 70 per cent light cycle and 30 per cent heavy cycle. This is cracked on a Dubbs two-coil unit. We achieve our cracking operation by holding about 1,025° F. on the light-oil coils and 910° F. on the heavy-oil coils, operating at 300-psi. pressure. We have used the unit to make carbon black feed oil with an A.P.I. gravity from 0°-2°. This is achieved on a blocked operation. The capacity of the unit is lowered, but we do get a premium for the carbon-black stock.

3. Reforming

Q. What is the effect of sulfur in the charge stock?

A. Houdry always takes the stand that since you have to treat the charge for contaminants and poisons you might as well remove the sulfur before using as feed. Otherwise, presence of sulfur will cause catalyst activity to decline to an undesirable point.

U.O.P. prefers on a startup to have about 10 grains of hydrogen sulfide present to sort of take the edge off the fresh catalyst. Then it's desirable to drop down to a concentration of about 2 grains. More than 10 grains will cause a loss of C_5's-plus and 20-30 grains will damage the catalyst.

Q. What is the effect of chloride content or chloride addition?

A. Chloride supplies an acid function and promotes dehydroisomerization

(Continued on page 118)

Beth-Co-Weld is widely used in waterflood projects, like this one in Texas.

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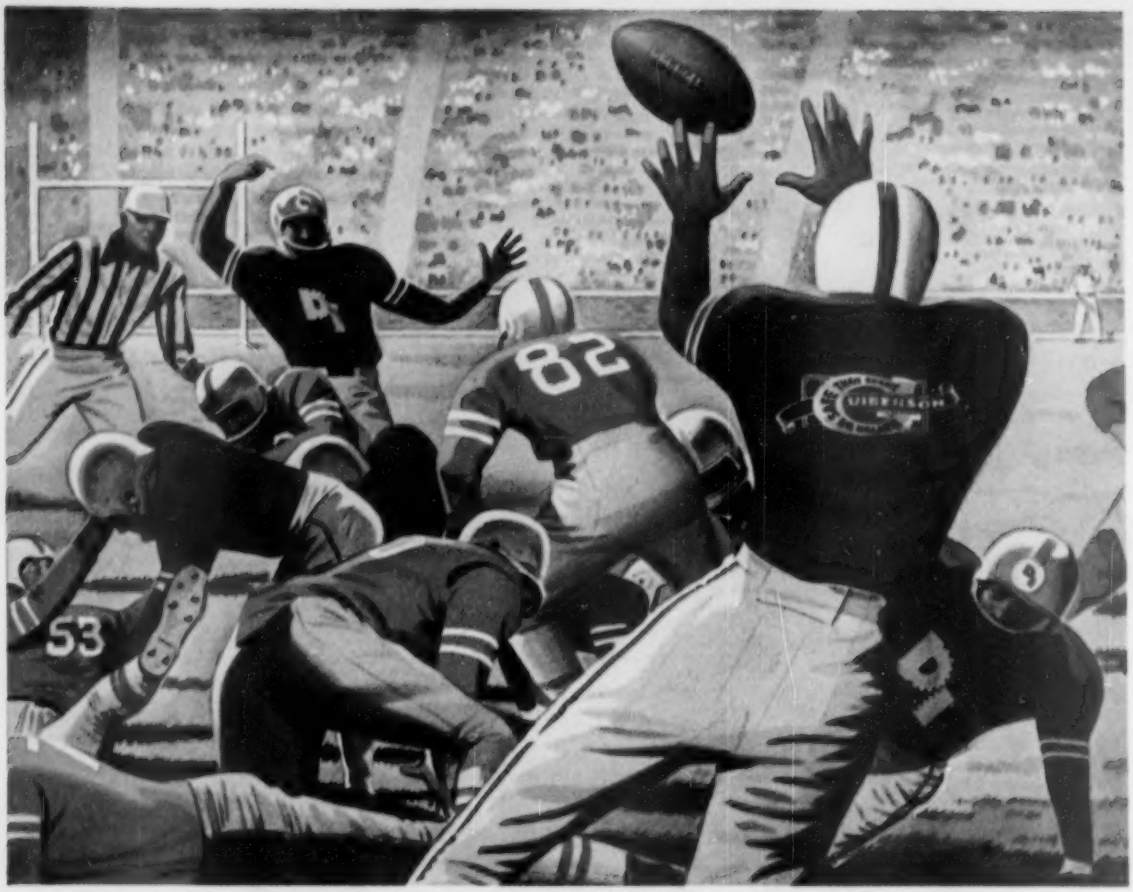

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and reforming action. There's no effect on the catalyst which would make it more or less susceptible to poisoning with chloride present. Chlorides do maintain catalyst activity and prolong the life of the catalyst.

Q. How is the catalyst chloride content controlled when the feed contains excess chlorides?

A. The content may be controlled by moisture injection, or the feed can be treated.

Q. Do poisons such as arsenic affect catalyst activity?

A. Yes, and they should be kept out. Arsenic forms an alloy which destroys the active surface on platinum catalyst.

Q. Does a cobalt moly feed pretreater remove lead, arsenic and chloride?

A. The cobalt moly treatment is very effective.

Q. How can we learn more about poisons?

A. Minerals & Chemicals Corp., in New York, has a brochure on contamination which shows effectiveness of clay treating and gives information necessary to design a cold clay-treating system.

Q. Has anyone had any experience using aluminum-coated piping and tubing to combat corrosion in reforming units?

A. M. W. Kellogg has reprinted an N.A.C.E. paper which shows safeguards to take, alloys to use, and the use of aluminum coatings.

Q. What is the upper limit for water content in feed to Platformers?

A. Republic had considerable water in its feed with no permanent damage. There was plugging experienced in the fractionator.

A. A small amount has no appreciable effect. Generally if you're going for high octanes, limit water as much as possible.

Q. What is the advantage of the multiple reaction chamber versus a single-chamber operation?

A. The ideal system for reforming would be isothermal. The commercial method, however, is adiabatic. There is a considerable temperature differential in the first reactor. Hence, the stream is brought back up to temperature before entering the second reactor, etc. In this way, you're in effect trying to achieve an isothermal condition. With a low naphthenic feed stock you could conceivably use one reactor since there is no change of temperature to any extent.

Q. Is there any trend to make all reactors the same size?

A. In certain designed units you have a swing-type of reactor which comes off stream for regeneration while the others remain on stream. Hence from a conformity standpoint you need the same size vessel.

Q. Is hydrogen blistering in catalytic reformers a serious problem and how can you control it?

A. One plant had trouble with a carbon-steel shell. An 18-8 liner was placed in the reactor which was sealed around the top but not at the bottom. No hydrogen could get behind the liner at the top and all of the pressure drop was across the bed. The hydrogen at the bottom, meanwhile, tends to be stagnant and won't work itself behind the liner.

At McMurrey, hydrogen blistering was occurring in stabilizer overhead condenser and receiver. An injection system was used to add ammonia to neutralize moisture and filming amine inhibitor to build up a protective film. It has worked for a year and has done a good job.

Difficulties were also being experienced on the stabilizer off-gas line and a carbon steel valve was replaced with one made from monel metal with good results. Finally, an alloy block valve is used wherever there is a pressure drop and this has proved successful in eliminating problems.

Q. Are there any data available on catalytic reforming or visbreaker gasoline?

A. Houdry had experience operating units with coker naphtha, although not with visbreaker gasoline. The naphtha has to be treated so it can't qualify as being raw. At any rate, a feed was made up composed of 50 per cent coker and 50 per cent straightrun. Of this mixture, paraffins were 50 per cent, olefins 19 per cent, naphthenes 20 per cent, and aromatics 8 per cent. It was highly contaminated with arsenic, lead, and sulfur, and qualified as being "rough stuff." It was treated in a cobalt moly pretreater and then charged to the unit. We were looking for yield rather than high octane and had very good results.

Q. What per cent of naphthenes are left in the reformate at a given severity level?

A. In one unit with 50 per cent naphthenes in the charge, 8 per cent were unconverted at 85 F-1 clear, 4.5 per cent were unconverted at 90 F-1 clear, and 1 per cent were unconverted at 95 F-1. In a second unit, with a feed containing 49 per cent naphthenes, 26 per cent were unconverted at 72 octane, 8 per cent at 79, 6 per cent at 85, and 3.4 per cent at 91 F-1. The yield of C_5's plus in the latter case amounted to 86 per cent on the feed.

Q. When running for the same octane number, how do the yields of a Platformer compare with those of a Rexformer?

A. When running for a reformate below a 95 clear octane number, there is little noticeable difference. The divergence occurs at 95-plus with the Rexformer yields considerably better. Its very noticeable when getting a 100-103 clear octane range product.

Q. How do the Rexformer and Platformer reactor inlet temperatures compare?

A. The reactor inlet temperature in the Rexformer is normally lower because you are removing the high-boiling, low - octane - number components from the product and recycling back to the reactor and to extinction. Hence, you don't have to hit it as hard.

Q. What is the experience of catalyst life in barrels per pound versus severity?

A. In the case of a nonregenerative process such as Platforming, the harder you hit the catalyst the more you reduce catalyst life. So far, U.O.P. hasn't felt it necessary to recommend that the catalyst be regenerated. Unpublished data show a satisfactory catalyst life in severe operations.

Houdry has a regenerative process which is still fairly new and its too early to make any definite statements. There may be some trouble with sulfate deposition.

Pan-Am Southern agrees that sulfate can be a problem. However, if sulfur is removed from the feed it might not be so bad.

Q. What are some catalyst life reports on regenerative processes?

A. Pan-Am Southern hasn't dumped the catalyst in its Ultraformer in 4 years and has processed 100 bbl. per pound in this time.

Ohio with a fluid hydroformer has processed 112 bbl. per pound with one regeneration.

Q. What is the practice in operating Reformers with respect to restricting end point of the feed stock?

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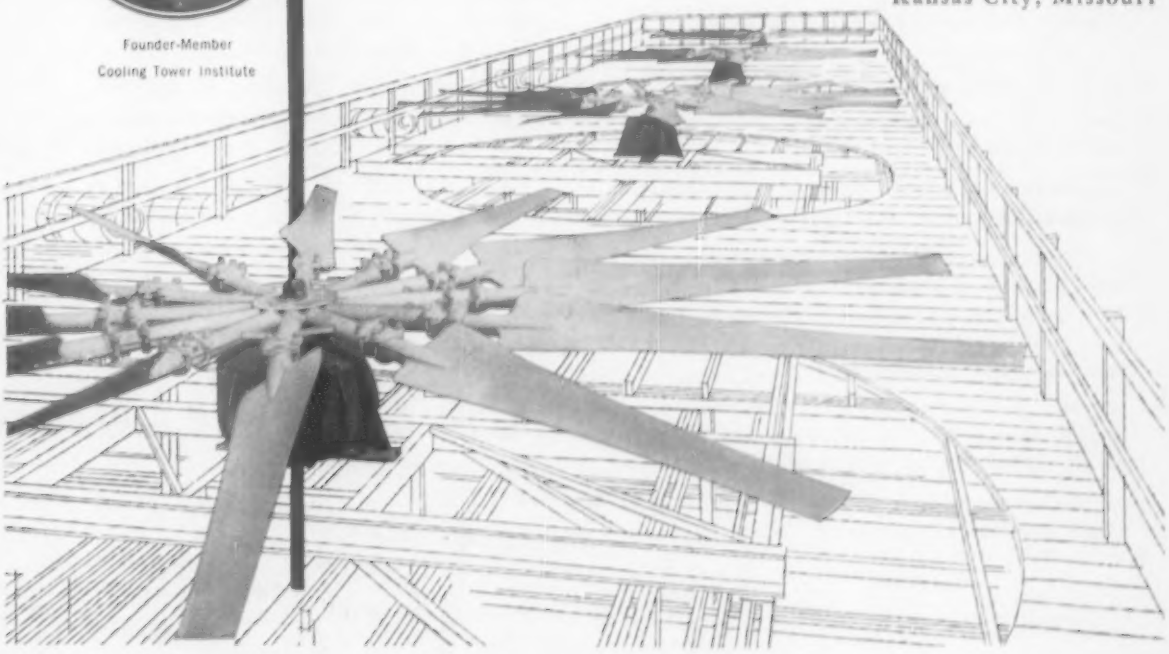

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A. One effect of catalyst reforming is to raise the end point of the product in the formation of aromatics. Hence, if you use 400°-e.p. naphtha as a charge stock, the resultant end point of the product might be 435. If you don't restrict the end point of the charge, your product could get out of the gasoline boiling range. Of course, this restriction wouldn't apply when you're making heavy aromatics.

Q. Do you find that a high end point will give you more carbon on the cattalyst?

A. You'd take care of this expectation by adjusting operating conditions.

Q. Isn't it customary on a regenerative process making high octane stock to rerun the reformate?

A. In general that's correct. You rerun to get rid of the heavy ends.

Q. What has been the experience in using a filming amine corrosion inhibitor, and what about catalyst poisoning from the nitrogen content of the inhibitor?

A. Anytime you put nitrogen in with a platinum catalyst you can expect an adverse effect. You can compensate for it somewhat by increasing the operating temperature, but the best recommendation is to keep it out of the reformer.

Standard of Ohio has used an amine in the pretreater for corrosion resistance, and to prevent fouling. The amount used is very small, 3-6 p.p.m., and most of it breaks down into ammonia and is removed in the stripper. Any amount which might go over into the reformer would be quite small.

If you use a Unifiner as a feed pretreater you wouldn't have to worry about the amines or nitrogen getting into the reformer. The corrosive materials and contaminants would be removed in the Unifiner.

TREATING

Q. What is the upper temperature limit that can be used in distillation without thermal decomposition of mercaptans and disulfides?

A. V. A. Kalichevsky, Magnolia Petroleum Co., has done a lot of work on this subject. He suggests it be done under a vacuum and shouldn't be over 270° F., preferably 250° F.

Atlantic hasn't had any difficulty in doctor treating below 300° F. However, when producing odorless solvents we have experienced trouble as low as 250° F. Its getting more and more critical in this field and you have to be careful.

Q. Does anyone have data on the relative merits of using monoethanolamine and diethanolamine in Girbotol units?

A. With fairly pure hydrogen sulfide MEA is better. It is susceptible, however, to forming stable compounds or complexes with other sulfur compounds. Hence, in these cases the DEA would probably be best.

Q. Has anyone devised a simple method for removing high concentrations of heat stable thiocyanate salts occurring in the Girbotol DEA streams?

A. Conventional method is to add soda ash and redistill. Most gasoline plants have a separate pot for redistillation.

Q. Has anyone had any experience with copper sweetening of range oil?

A. Esso has had reports from overseas that using an extractive system on kerosine stock will make it respond quite well.

4. Miscellaneous

Q. Has recycling of highly aromatic streams through furnaces with coil outlet temperatures of 900° F. been attempted? Were there any adverse effects noted?

A. Houdry found a case where reformer effluent was charged right to a thermal reformer with the highest temperature in the coils being 1,000°-1,100° F. No difficulty was experienced with aromatics at the high temperatures.

McMurrey ran a heavy platformate—380° i.b.p.-580° e.p.—and charged it to the cat cracker where a heavy carbon laydown resulted.

Q. By what means can air recycling be controlled on forced-draft cooling towers when the wind is from the back of the tower?

A. Suntide had difficulty with a tower and added 12 ft. extensions to the 4-ft. stacks above the propellers. An effect was to drop the load on the fans. As a result, the pitch of the blades was changed and the fans loaded up again, thereby getting more air contacted with the water.

Q. Does anyone have any hints on preventing fouling in preheat exchangers?

A. Republic had an unsuccessful experiment using spent caustic in the poly unit feed hydrogen sulfide treater. The spent caustic fouled up the heater. It was replaced with fresh caustic and 1 year's satisfactory operation has been experienced.

Another plant was gas blanketing the fresh feed storage and was realizing greater life with feed-slurry exchangers. Finally it went to circulating kerosine on the fresh feed side to improve heat transfer. This was done on a periodic basis to permit continued operations pending a turnaround period.

Q. How long would the efficiency hold up after washing with kerosine?

A. About a month, then it would be washed again. It was mainly a pressure drop problem.

Q. Was the kerosine lost as a product?

A. No, it was rerun through the crude unit.

Q. Are there any other suggestions?

A. In cat reforming go direct from the crude unit to a gas blanketed or floating-roof tank to exclude oxygen.

Sunray had experience operating cat crackers and found that an oxygen stripper will work well to remove oxygen from the feed. Fifty-pound natural gas is used to accomplish this.

Q. Did you have cracked stock as feed with the stripper?

A. About 75 per cent coker gas oil was being stripped.

International had an interesting experience. A reformer was tied in to a floating-roof tank. But exchanger fouling was experienced after a 5-6-week run. It was found that the suction line to the feed pump was quite long, and without a proper head at the pump, it was in effect operating under a vacuum. Hence, air was being pulled in around the packing. This problem was solved by maintaining 1-lb. positive pressure on the feed line at the pump.

International has also been cleaning with kerosine on the crude side of exchangers. A light gas-oil wash is given the exchanger every 2 weeks for about 4 hours' duration. This way it's been possible to maintain a run of 18 months without bad pressure drop and satisfactory heat transfer.

Q. Do you have a desalter?

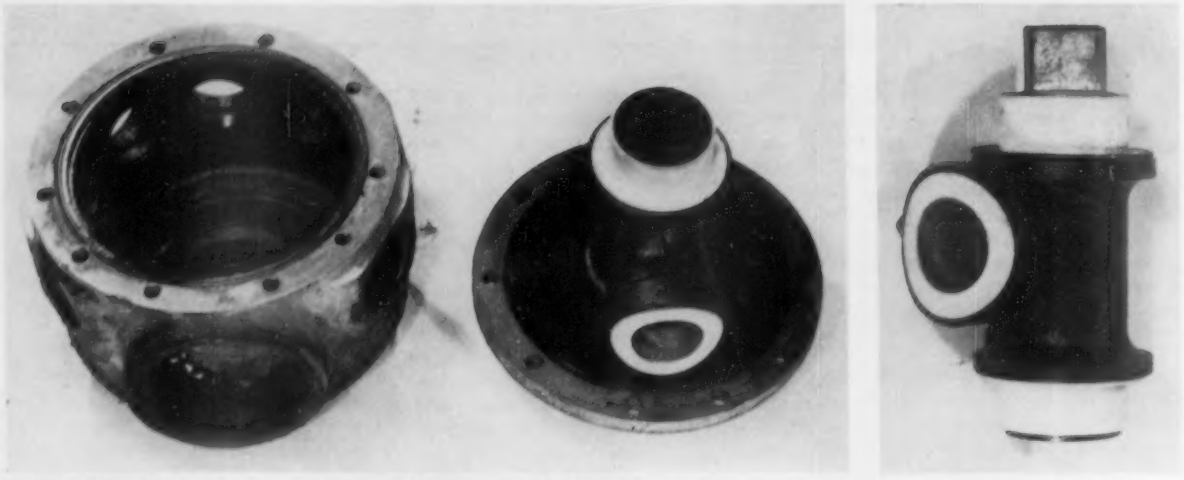
A. No.

Q. Is Atlantic having success in blanketing a floating-roof tank with nitrogen?

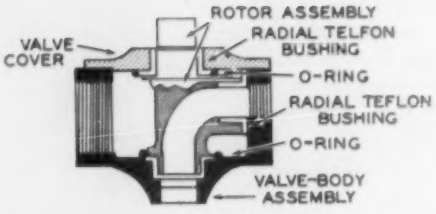
A. Yes. A small amount of nitrogen is used and it's been very successful in cutting down preheat exchanger fouling on the reformer.

Q. Is this with cracked stock?

A. No.



VALVE AND MANIFOLD functions are combined into this single multiport valve. Flow from all but one inlet port combines to emerge from the large exit port. The Teflon-sealed rotor diverts fluid from any selected port to test facilities. Fig. 1.



With this new seven-way rotary valve . . .

Production Manifolds Are Streamlined

This new multiport valve will streamline and cut costs of lease-production installations and is ideally adaptable to automatic production and testing. Field tests show that it has long life even when operating under severe conditions of corrosive and erosive fluids.

by J. O. Scott
District Editor

MANIFOLDING production flow lines from oil wells conventionally requires a header with considerable piping and valving. With an eye to streamlining this system Union Oil Co. has recently been testing a new multiport valve to take the place of the manifolds and associated valves. The features of the valve are:

1. It serves as a common connecting point of seven flow lines.

2. Flow from six of these lines is combined and exits through a large port.

3. Flow from the seventh line is directed to a separate outlet. Any of the seven streams can be directed to this outlet by the turning of the valve.

Tests of the valve have been made on leases at Santa Fe Springs, Calif., where a combination of water, sand, and sulfur compounds are commonly produced with the oil. Handling this type of flow, one valve was in service for 8 months without showing leakage, wear, corrosion, or erosion.

Simplicity . . . Because of its design the new seven-way rotary valve fits the function of production headers wherein flow from a number of wells is combined so that it can be handled in a single separation and treating system. The valve also provides for individual well testing in a single test separator. The test line would be hooked up to the rotor outlet of the valve which can receive fluid from any of the input lines through the turning of the valve.

Fig. 1 shows the construction of the valve. The inner plug revolves on Teflon bushings which are sealed by O-rings. It has a radial opening which receives fluid from any of seven radial ports. The radial opening of the plug also is fitted with a Teflon bushing which seats against the machined surface of the valve body. The Teflon requires no lubrication, forms a tight seal, and is completely resistant to corrosive and abrasive fluids.

Present valves have been designed for 150 psi. but are tested to 900 psi. No detectable leakage has occurred in the working-pressure range.

Field tests . . . Fig. 2 shows an installation at Santa Fe Springs where production from three wells was manifolded into the valve. The flow from one well contained highly corrosive sulfurous water along with the oil. Another well produced fine abrasive sand with the oil and the other well produced relatively clean oil. Gravity of the oil averaged 32° A.P.I.

Flow-line pressures of the wells ranged between 22 and 25 psi. No noticeable pressure drop occurred across the valve.

One valve was in service for 8 months and then was replaced for checking. A minute inspection which included measuring all parts with a micrometer showed no signs of wear, leakage, corrosion, or erosion. The second valve has been in service for 5 months and is still leakage-free and operates as well as when new.

Applications . . . Fig. 2 shows how the seven-way valve would be hooked up as a header in an installation for testing each well by turning the valve manually. Fig. 3 is a photograph of its use with an automatic well test selector.

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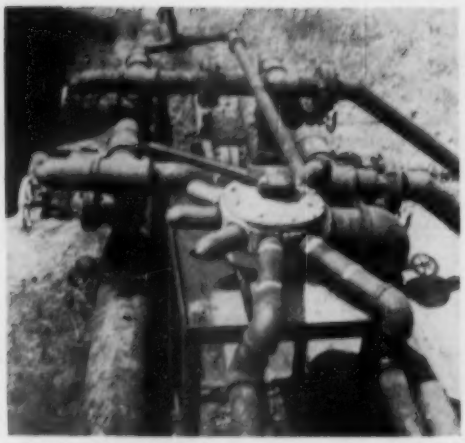
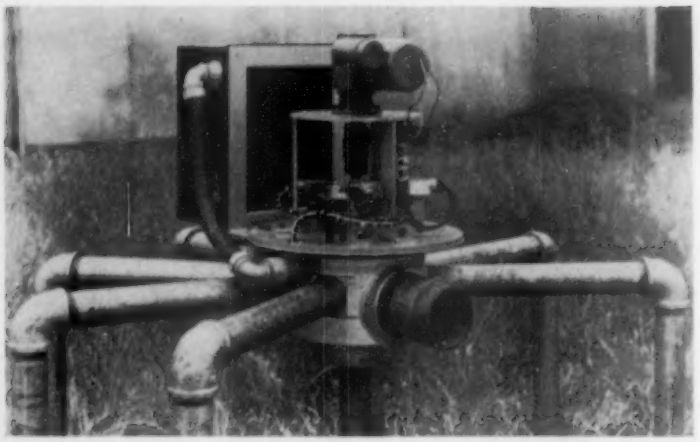


MANUAL OPERATION requires only a short handle. Ball-plugging of one inlet port provides off position for intermittent testing. Fig. 2.



AUTOMATIC TESTING is provided by this electrically controlled driving motor. Time clock and switches determine testing interval for each stream and rotor moves from one to other in succession and then returns to first port. Fig. 3.

The selector may be set so that each well is tested in sequence for a certain period of time or so different wells can be tested different lengths of time. A typical schedule would have each well on test 1 day out of 7. The valve would rotate from well 1 to well 7 and then return to well 1.

For intermittent testing, the valve would be hooked up to six wells and one port, position No. 1, would be plugged. Then when no testing is going on the valve would be rotated to position No. 1—the off position. The automatic selector can be set to test the wells in sequence but to return the valve to the off position in between tests.

Intermittent flow to the well-testing system is particularly desired when metering of both oil and water is desired. This allows a settling period for produced water to be measured. Fig. 4 shows such an installation.

Automatic testing . . . In this installation 2 seven-way valves with automatic selectors are used and these are controlled in a sequence to provide control of 12 wells. One valve controls six high-pressure wells and one valve controls six low-pressure wells. Controls provide fail-safe operation of the system.

The start of a cycle is initiated by the low-level control switch of the metering tank. With tank empty the switch starts the valve actuator to drive the high-pressure valve from the closed position to say port 2. At this point the valve will stop to permit the well flow to be diverted from the common flow of crude through the valve body to the selector valve rotor, then to the high-pressure gas trap. At this point the gas is separated. The gas flows out the top line, into the main gas line where the total gas flow is metered.

Crude is taken from the high-pressure gas trap to the metering tank. When the tank fills, the high-level switch is tripped and the valve is switched from port 2 to the off position. The time the valve is in the off position is the settling period which is controlled by a time clock.

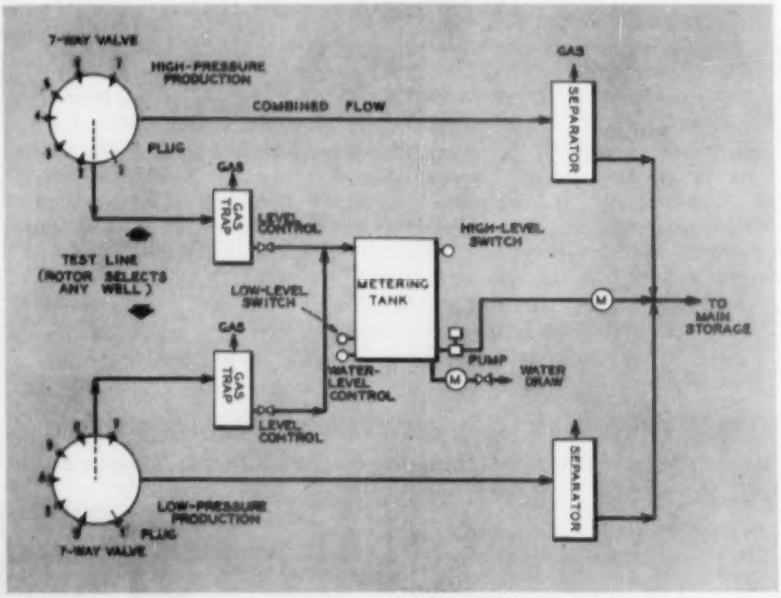
The settling cycle allows for separation of water from oil and after a preset time interval the time clock signals the water draw valve to operate. Water flow is metered and recorded. When the bottom oil level reaches the water level control, the water draw valve is closed and the crude is pumped from the metering tank. Oil volume is recorded and the oil enters the line to the main storage.

After the oil is pumped out, the low-level switch shuts the pump down and actuates the valve drive. The valve rotor moves to the next port in sequence, in this case port 3. Thus one cycle has been completed and the second cycle has been started.

When the last well in the high-pressure system has been tested, the metering tank becomes available automatically to the low-pressure system.

Circuiting is designed to be fail-safe in operation and in the event of power failure the valve moves to the off position. When power is restored, the system will resume operation.

The seven-way multiport valve is made by Win-Well Manufacturing Co., Los Angeles.



INTERMITTENT TESTING application is this system where water is produced. With automatic controls, the valve directs flow to test line from each well in succession but returns to off position between well tests. Fig. 4.

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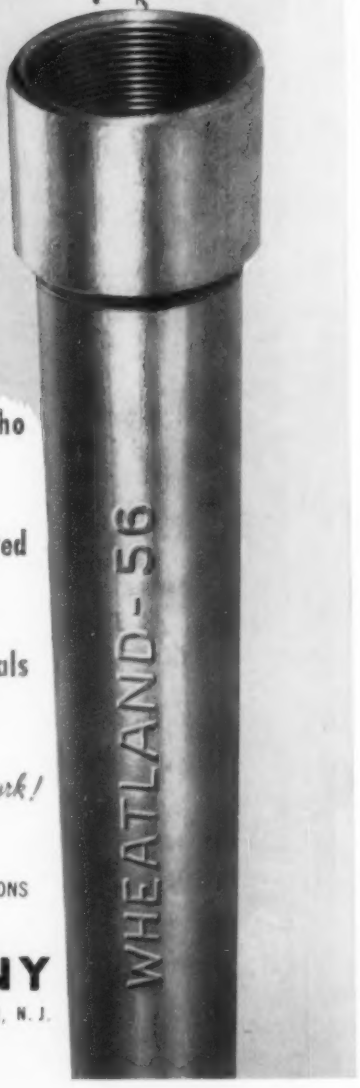

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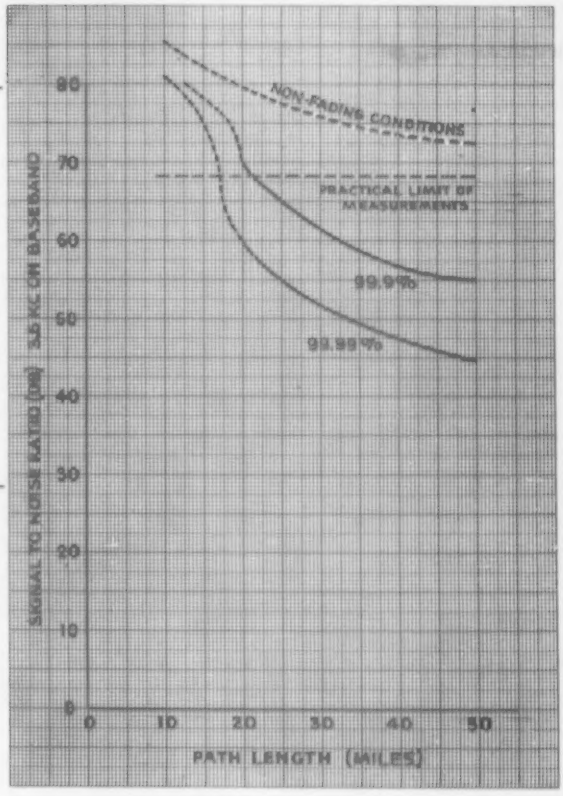


SIGNAL TO RANDOM NOISE ratio curves for microwave equipment. Fig. 8. Conditions of operation are as follows:

1. Six-foot-diameter parabolic antenna used on both ends of the path. For 4-ft. parabola, correction is —3 db.; for 2-ft. parabola, correction is —9 db.

2. Percentages indicate expected reliability over path having average fading characteristics; not applicable for paths over water or smooth terrain where atmospheric conditions produce unusual fading.

3. Terrain clearance is equal to or greater than values recommended in Fig. 2.

4. No allowance has been made for tube deterioration, slight misalignment of antennas or other practical factors that might prevent equipment from performing with maximum efficiency. Conservative design practices indicate the desirability for use of a 6-db. safety factor which should be used in system calculations.

by D. R. Marsh

This is the second of a two-part discussion on

How to plan a Microwave Radio Relay System

THE range of a microwave relay system is determined by the permissible signal-to-noise ratio. Calculations for a given path is a rather complicated procedure, involving consideration of antenna size, transmitter power, path length, fading, receiver noise figure, system band width, and other factors. These calculations, however, can be reduced to a simple graphical method.

Fig. 8 is a plot of signal-to-noise ratio which can be obtained in a 3.5-kc. portion of the baseband. The data are for microwave equipment operating normally over paths of different lengths and under conditions as outlined. Correction factors are to be used where actual operating conditions differ.

The numerical value of signal-to-noise ratio depends upon method of measurement and possible limitations of measuring equipment. The curves indicate random noise measured on the baseband only, and do not include a.c. hum independent of path length. Measurements greater than 68 db. are difficult to obtain because of local noise and hum. Curves are, therefore, shown dotted above this point. Also assumed is 100 per cent equipment reliability.

As an indication of the reliability represented by these percentages, a corresponding number of hours of outages per year are shown in the accompanying table. Ordinarily, outages of this type occur during 3 to 4-hour intervals at about sunrise and sunset.

Per cent reliability	Hours outages per year
99.0	87.6
99.9	8.7
99.99	0.87

Author is in communication systems engineering, Radio Corporation of America, Camden, N. J.

Multihop Systems

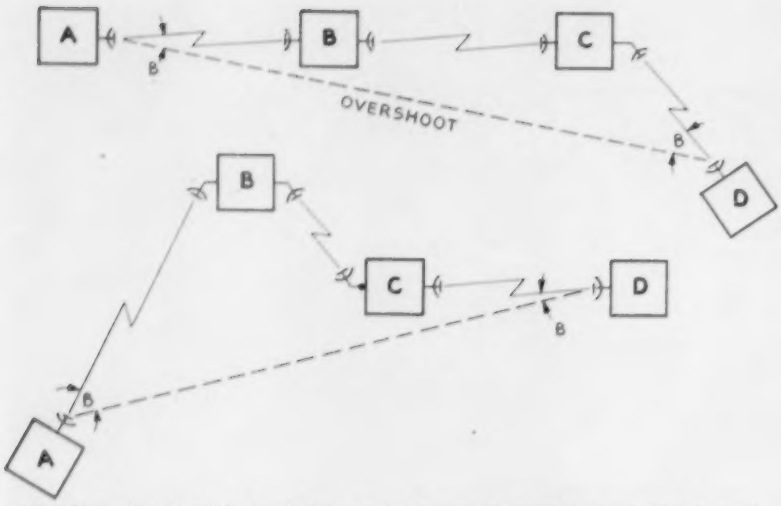
The high power, stability, excellent transmission characteristics, and operational features of the microwave equipment make it well suited for use in multihop systems.

Location of sites . . . Unlike single-hop systems where the transmitter and receiver location are ordinarily fixed by the terminals of the circuits, intermediate relay points in a multihop system can frequently be selected to take advantage of natural terrain features. This flexibility increases the responsibility of the designer, since choice of optimum sites requires a careful study of construction costs, land costs, site accessibility, power availability, and other factors.

Because outage time due to fading is cumulative, it is usually desirable to use shorter paths than the longest which could be employed in a single-hop system. If the path lengths are too short, on the other hand, the possibility of outages due to equipment failure and signal distortions is increased because of the large number of hops required. Path lengths in the order of 20 to 30 miles are recommended in multihop service as a compromise between these requirements.

Certain obvious physical considera-

PIPELINING



IF SITES ARE IN LINE interference, known as overshoot, might result. Fig. 9 (top).

TO PREVENT OVERSHOOT, the sites should be staggered, with angles varying at least 12°. Fig. 10 (above).

tions must be kept in mind in selecting sites. These include accessibility under all types of weather conditions, availability of power, CAA restrictions, and the suitability of the soil for tower foundations and guy anchors.

In 960 and 2,000-mc. systems, where the parabolic antennas are tower mounted and connected by coaxial transmission line to RF equipment, only two frequencies are necessary at a repeater station as shown in Figs. 10 and 11. For frequencies of 6,000 mc. and above where the parabolas are mounted on top of the building and reflectors are mounted on the towers, it is necessary to use four frequencies at repeater stations.

Although a line-of-sight path would not ordinarily exist over the distance covered by a multihop system, certain atmospheric conditions may cause abnormally long-distance transmission to occur. If the sites are in line, this might cause interference known as overshoot as shown in Fig. 9.

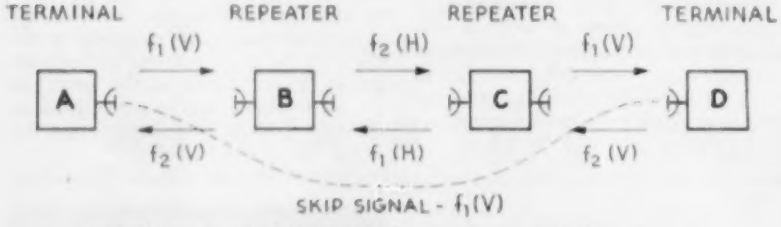
In such cases it is advisable to locate site D so that a line drawn from site A to site D is at least 12° from a line drawn from site A to site B, or, alternatively, so that a line drawn from C to D is at least 12° from the line A to D. Both of these conditions are shown in Fig. 10.

Antenna polarization . . . Polarization of antennas in a microwave relay system is an effective means of reducing the possibility of interference. With opposite polarizations, approximately 20 db. of rejection can be obtained. This would involve, for example, using horizontal polarization for the A transmitter and vertical polarization for the C transmitter as shown in Fig. 10. An electromagnetic wave is linearly polarized when the electric field lies wholly in one plane containing the direction of propagation.

The unwanted overshoot signal is now considerably attenuated since less power is radiated in the direction of the station subjected to interference. In addition, the gain of the receiving antenna at the station will be reduced when receiving an offbeam signal.

For a high-grade circuit, the level of the overshoot signal should be at least 30 db. below that of the desired signal. This amount of protection can often be obtained by the judicious use of terrain features, even when the stations are virtually in a straight line, provided the overshoot path A to D in Fig. 9 is not less than 50 miles in length.

As a safe rule, however, it is wiser to obtain the required protection by means of antenna directivity since the overshoot signal is subject to erratic propagation conditions. The signal may, during periods of abnormal propagation, arrive at D comparable in strength to the direct signal transmitted from C.



ALLOCATION OF FREQUENCIES and antenna polarization. Fig. 11.

System reliability . . . Statistics of the local power utility should be studied to determine if the frequency of storm or other outages is higher for a given area than over a potential alternate route. It is desirable to keep a record of the occurrence of such outages and their duration if an accurate estimate of the performance of the microwave equipment alone is to be made.

Preventive maintenance will be essential to maintain the equipment in first-class working condition. With present equipment designs, metering facilities are built in or are conveniently accessible with a multipurpose instrument. Therefore, such maintenance is neither difficult nor expensive.

Propagation reliability . . . In a multihop system, if the signal-to-noise ratio on any of the hops drops below the minimum acceptable value, the signal-to-noise ratio of the entire circuit will, of course, be below the minimum.

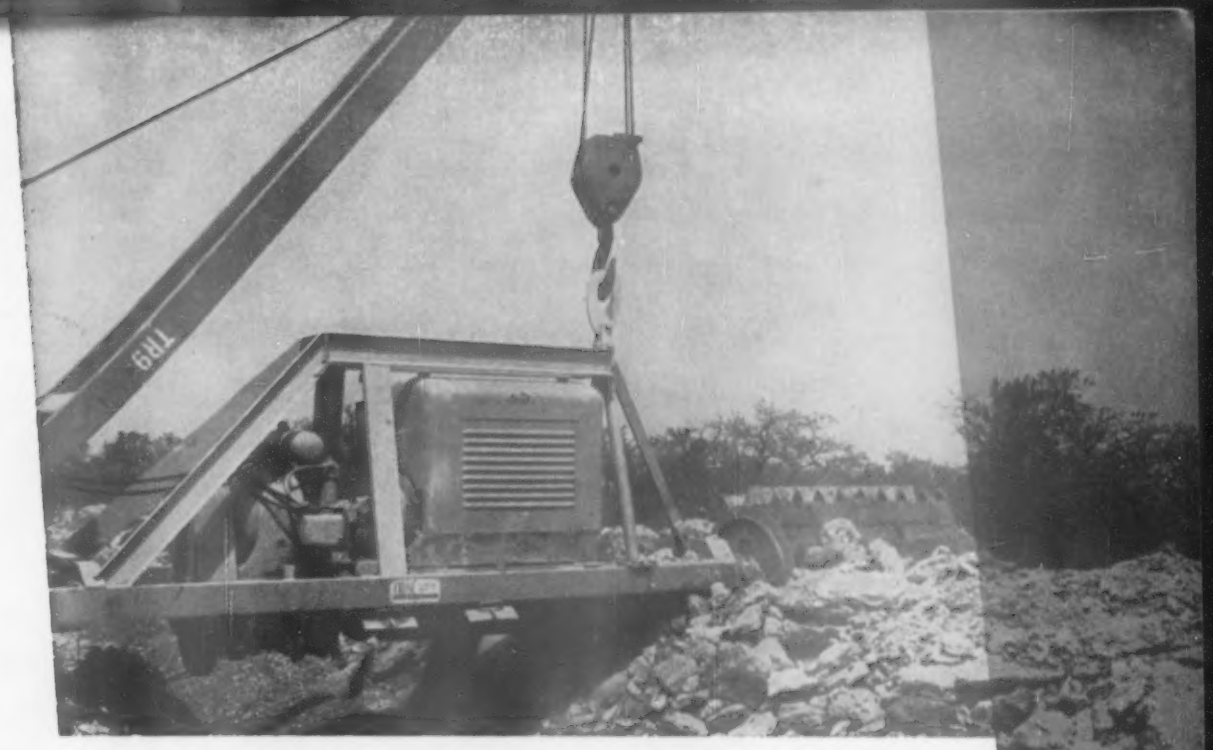
To calculate the total outage time for the entire system, conservative design practice requires the assumption that none of the individual hop outages will occur simultaneously. This means that the over-all outage time is the sum of the outages of the individual hops.

Thus, if a system has three hops each with a reliability of 99.99 per cent, the individual outage time would be 0.01 per cent. Therefore, the total outage time would be 3 times 0.01 per cent of 0.03 per cent and the over-all system reliability would be 99.97 per cent.

Equipment considerations . . . Since most relay points are unattended, a number of special equipment problems arise.

To provide maximum system reliability, provisions should be made for RF standby equipment at unattended stations. This equipment can be switched into position when called for by the fault sesing circuits. At the same time a fault would be sent to maintenance headquarters which would dispatch a repairman to the site. A service channel should be an integral part of the equipment.

The section of the proper towers for the support of the antenna system involves several factors of major importance, of which tower twist and deflection rigidity are paramount. The factors of safety, wind and ice loading, load-supporting ability, lighting, grounding system, and painting must also be considered. The specifications given in the RETMA Tentative Stand-



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ards Proposal on Microwave Towers and Mechanical Characteristics for Microwave Antennas are recommended as a basis for determining tower requirements.

The height of the tower and the obstructive area of the parabola will be determined by the path calculations. Additional information relative to the climatic conditions and the nature of the soil will be necessary. Unattended repeater station tower requirements will always require individual analysis.

Tower light control . . . Unless the tower lights are to be left on continuously, are observed by a responsible individual, and failures reported locally to the CAA, a photoelectric-cell control relay must be provided to turn the lights on and off. The controls for these lights must have contacts which initiate a failure-alarm signal to some attended location. Before finally choosing a site, a check should be made with the nearest CAA office to determine the specific local requirements for lighting.

The buildings can be any of three basic types: prefabricated steel, poured concrete, or cinder block. Buildings must be well ventilated yet waterproof and verminproof. Automatically operated vent fans help to maintain proper operating temperatures inside the building.

The concrete building and the cinder-block building are more expensive than the prefabricated metal building, but they do have the advantages of being tighter, provide better heat insulation, and are sturdier in appearance. They provide better protection from hunters and vandalism and the slab concrete roof is excellent protection against falling ice.

When a gasoline-driven generator is installed, it is recommended that the building be provided with a firewall between the power room and the equipment room. The firewall provides protection in case of gasoline fire and also prevents corrosive battery fumes from entering the equipment room.

Auxiliary power . . . Every effort should be made to locate the relay station close to a good source of commercial power. However, even the best of power lines, especially those in rural areas, are subject to interruption. Therefore, if utmost reliability is necessary, an auxiliary power unit will be needed.

A 3.5-kw. gasoline-driven power unit is desirable for unattended repeater stations. This will provide power for microwave and channeling equipment, interior lights, test equipment, soldering iron, and tower lights.

The generator must be provided with an automatic transfer panel to sense the loss of the main power, crank the gasoline engine, transfer the RF equipment's power leads to the auxiliary generator, and return the equipment back to its normal source of power after the source has been restored for at least 15 minutes.

If the time required for switching of this type cannot be tolerated, then a continuous power unit having an a.c. motor, an a.c. generator, and a gasoline engine connected to it with a solenoid-operated clutch can be provided.

In locations where no primary power is available, two motor-generator sets with automatic changeover facilities are usually installed.

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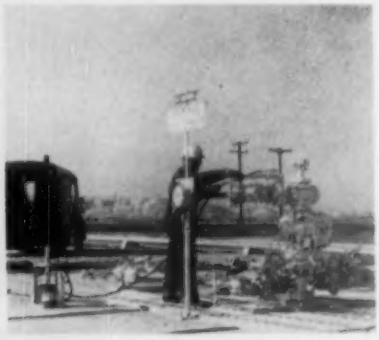


CHRISTMAS TREES receive mobile service twice a year.

Mobile crew services lease valves

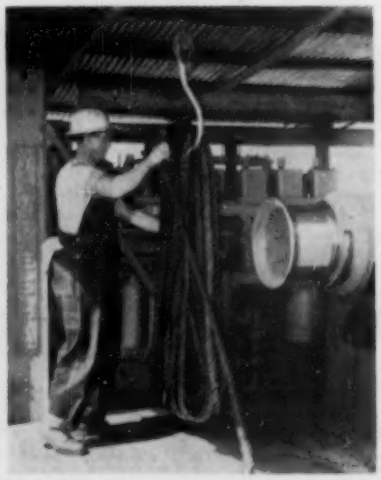
A NEW idea in mobile maintenance has been reported by Richfield Oil Corp., Bakersfield northern division, that allows a substantial savings in time and valve-replacement costs.

Two especially designed valve-maintenance trucks, adhering to an established schedule, are now servicing the more than 22,000 valves on Richfield leases. The work is done in a fraction of the time previously required.

One truck services christmas trees twice a year and trap farms every 4 months. Over 7,000 valves are lubricated. At the same time the second truck services the more than 15,000 valves at Richfield's three natural-gasoline and compressor plants.

The valves range in pressure from 175 to 7,600 psi.

Richfield estimates that the mobile maintenance plan, in addition to saving time and labor, has effectively reduced valve-replacement costs, since scheduled lubrication has resulted in increased valve efficiency.



CATLINE is placed out of the way on this hook.

Catline hook makes ideal storage place

A GOOD method of storing a catline after use is shown here by a driller for Parker Drilling Co. Good housekeeping around a drilling well promotes safety and efficiency.

On this well, walkways are outlined with old drill bits and the entire area around the well is kept clear of junk. Ladders are clean and caution signs are prominent.

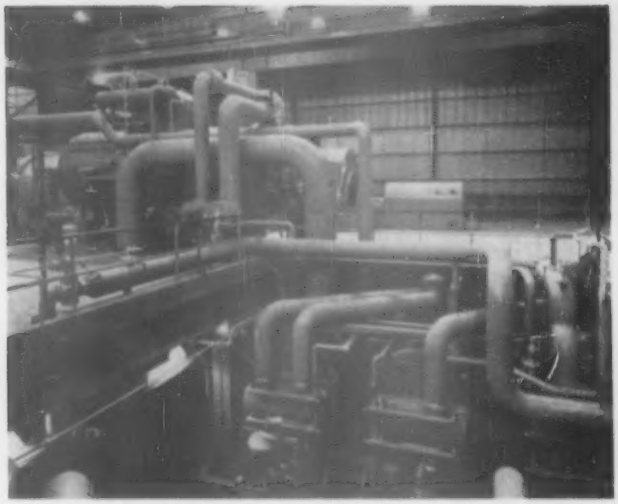
Properly hanging the catline and keeping the rig floor clear and clean around the cathead are prime safety requirements around any drilling well. Life of the line is extended also.

It's believed to be a "first"

Steam Plant Uses Distilled Sea Water

Use of evaporators not as costly as one might suppose

by D. H. Stormont
District Editor



SEA-WATER EVAPORATION system for supplying one of the two huge turbine generators at Morro Bay. The triple-effect evaporators are seen on the lower level and above them is the high-purity station evaporator.

PACIFIC GAS & ELECTRIC CO. is successfully using sea-water evaporators to produce fresh water for boiler operations and other uses at its new Morro Bay steam plant, near San Luis Obispo, Calif. It is believed to be the first industrial use of sea-water distillation in the United States.

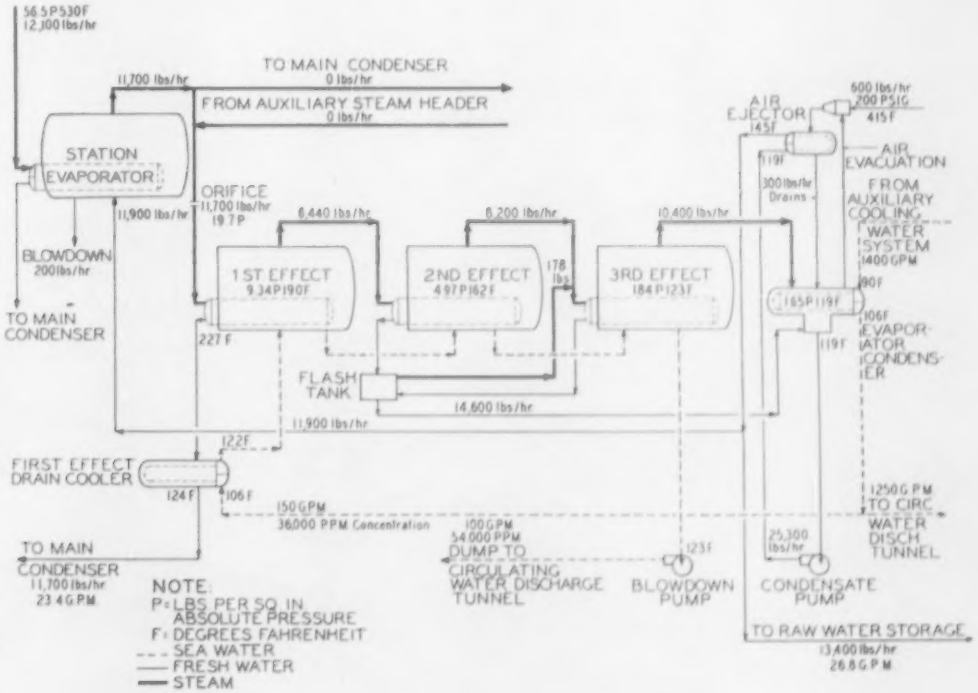
Decision to use the salt-water evaporators was brought about by scarcity of fresh water in the Morro Bay region, and the desire of P. G. & E. to conserve the small local supply. The site was desirable except for the water problem.

Though use of sea-water evaporators does increase the cost, actually it is not as high as one might think. Cost of raw water is only one factor in the total cost of makeup water as it is fed to the boilers.

When vapors from the station evaporator are used to distill the sea water, cost is about $2 per 1,000 gal. (based on $1.75 per barrel fuel oil). Had available well water been used it was estimated that treating costs alone would have been about 93 cents per 1,000 gal. Capital costs for building a reservoir on a nearby watershed were higher than those for the sea-water evaporator.*

Distillation is carried out in two sets of sea-water evaporators, one for each of the two huge boilers which supply steam to 156,000-kw. turbine-genera-

*A. W. Bruce, fall conference of San Francisco section of A.S.M.E., November 12, 1954, San Francisco.



METHOD used at Morro Bay by which approximately 50 g.p.m. of fresh water is produced by each triple-effect evaporation. Fig. 1.

tors. Each set has three horizontally mounted cylindrical tanks, 17 ft. long and 6 ft. in diameter. Each "triple-effect" set has a production capacity of 50 g.p.m. of fresh water (about 1,750 bbl. daily). Of this amount about half is for boiler makeup and remainder is for general utility purposes.

Triple-effect evaporation . . . Under these conditions heat is supplied in the first effect of each set by steam from the station evaporator. Steam entering the first tank has a temperature of about 225° F. and a pressure of less than 20 psia.

This original heat is used only in the first effect; the condensate is returned to the plant's boiler system. Steam generated in the first tank is used to heat the tubes in the second tank. It then is passed to the station's evaporator condenser. Steam generated in the second tank heats the third effect, and then goes to the station's evaporator condenser (Fig. 1).

The first effect distills about 13 g.p.m. of fresh water at an operating temperature of 190° F. Effect No. 2 produces about 16 g.p.m. at 162° and the third effect produces about 21 g.p.m. at 123° F.

The same sea water passes through all three boiling stages before being expelled into the plant's discharge system. Thus its salt content becomes progressively more concentrated as it is boiled and reboiled. It is introduced at a temperature of about 115° F., after having been used in the station auxiliary cooling system and evaporator condenser.

About 150 gal. of sea water is processed to produce 50 gal. of fresh water. The water charged to the first-effect shell has a solids concentration of 36,000 p.p.m. As it passes through the succeeding effects its concentration increases. The approximately 100 g.p.m. discharged as blowdown from the third-effect evaporator has a concentration of approximately 54,000 p.p.m., a 50 per cent increase.

Two-effect evaporation . . . As about half of the water produced by the seawater evaporators need not be of the purity required for boiler makeup, provisions are included whereby only the second and third evaporators are used for generating steam from sea water. In this case, shown in Fig. 2, the first effect is used as a high-purity evaporator.

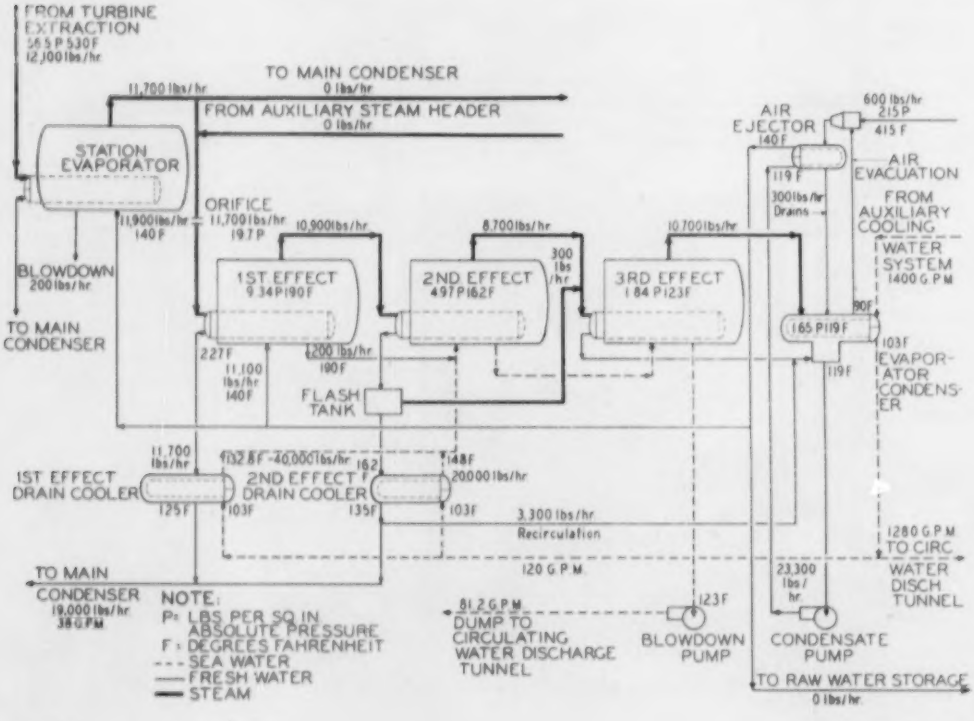
Vapor from the station evaporator generates steam from the first-effect evaporator, as in the first case. However, makeup water supplied to the shell is 50 p.p.m. effluent from the second and third effects. Under this method of operation the first-effect condensate has a purity of about 2 p.p.m. When combined with that from the station evaporator, purity of the water charged to the boilers is in the order of 1 p.p.m.

Evaporator design . . . The three evaporators in each set contain 290 1-in. tubes installed horizontally in the lower half of the shell. In all but one 16 BWG aluminum-brass tubes are used, with naval rolled brass tube sheets and cast bronze floating head covers. For experimental purposes the first-effect of one unit is equipped with 70-30 cupro-nickel tubes and 9-10 cupro-nickel tube sheets (inhibited with 0.5 and 1.5 per cent Fe, respectively). All shells are of ⅝-in.-thick welded copper-bearing steel.

Absolute pressures maintained are approximately 9.34 psia. in the first-effect evaporator shell, 4.97 in the second-effect, 1.84 in the third-effect, and 1.65 psia. in the evaporator condenser. The high vacuum maintained is by means of a two-stage, twin-jet air ejector.

Starch and boiler compounds are added to the sea water before it is charged to the first-effect. These modify the mineral deposits on the tubes so they can be more easily cleaned. Formation of scale around the heating tubes and tank interiors is minimized by the low boiling temperatures used. As a guard against excessive rates of scale buildup, meters with audible warning devices keep a check on the saline content of the water as it is expelled from the third tank.

The new power generating facilities operate on fuel oil, consuming about 12,000 bbl. daily at full load. Oil is delivered to the plant via a 24-in. submarine loading line which extends about 4,500 ft. offshore. Oil is stored in four 168,000-bbl. tanks.



TWO-EFFECT evaporation is employed to produce high-purity water for boiler makeup. Water from the second and third effects, containing about 50 p.p.m. of solids, is charged to the first effect. Fig. 2.

300,000 b/d

. . . this will be Creole Petroleum Corporation's crude distillation capacity when the ***FOURTH FOSTER WHEELER UNIT*** *goes on stream at Amuay Bay*

THE THREE Foster Wheeler Crude Distillation units below, on stream at Creole's Amuay Bay refinery in Venezuela, are now scheduled to be joined by a *fourth unit* which will increase the crude charging capacity to approximately 300,000 bbl. day. The new FW 75,000 bbl/day single-stage Crude Distillation unit can be operated as a crude topping unit at a capacity of 110,000 bbl/day.

Also included in this latest expansion program will be a Lube Hydrofining unit; a Hydrofiner for the desulfurization and general quality improvement of Diesel oil; a Phenol Extraction unit; a Propane Dewaxing unit and complete blending, canning and packaging facilities. All process units will be designed and constructed by Foster-Wheeler.

For further information, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER FW WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

by W. L. Nelson
Technical Editor

COST-imating

Pipeline Construction Costs

COST INDEXES (1946 = 100) OF PIPELINE COSTS

	Finished steel	Engines	Pipelines*	Labor	Nelson[1] ref. construction
1946	100.0	100.0	100.0	100.0	100.0
1947	115	109	114	113	117.0
1948	136	117	131	128	132.5
1949	148	125	142	137	139.7
1950	154	126	148	144	146.2
1951	162	146	157	153	157.2
1952	170	147	166	163	163.6
1953	183	148	177	174	173.5
1954	187	151	184	183	179.8
1955	196	153	191	190	184.2
1956 est.		162		198.3	195.6

***Finished steel, 50 per cent; engines, 5 per cent; and half skilled and common labor, 45 per cent.**

TABLE 1—MISCELLANEOUS PIPELINE COSTS (1946)
(Dollars per mile except as noted)

	Material	Labor	Total
Move on and off		60	60
Right-of-way (easement)[2,7]			247-1,500
Land rights (gas companies)[2]	(2.7% of investment)		
Surveying[2]		41	41
Clearing of right-of-way[2]		21-206	21-206
Total surveying, clearing and right-of-way[2]			800-1,650
Hauling and stringing,[2] ct. per ton mile		30	30
Laying pipe and welding, per inch diameter[2]		75-85	75-85
Ditching, machine, 24-in. depth[2]		310-560	310-560
Freight on pipe (f.o.b. mills),[2] dollars per ton	15-30		15-30
Backfill and cleanup		90-100	90-100
Telephone system[2]			667
Base radio station, complete,[5] each			3,100
Portable radio, car or boat,[5] each			525
Two-pole line[6]			460
Microwave system[6]			740
Pipe cost, $ per ton[2]	83-118		83-118
Pipe cost, second-hand, good[2]	(70% of new)		
Pipe cost, second-hand, usable[6]	(40% of new)		
Inspection		60-80	60-80
Supervision and engineering		550	550
Supervision alone		60	60
Profit			210-300

TABLE 3—STATION INVESTMENTS (1946)
(Dollars per horsepower)

	Material	Total
*Gas-transmission stations:[2]		
Structures and improvements	32-46	
Equipment	136-174	
Total or complete		170-200
Total or complete		$55,000 plus $160/hp.
Total or complete		20-25% of total system
Gas measurement and control[2]		0.6% of total investment†
Gas field stations or compressors[2]	110-137	
‡Oil, pump stations:[2,4,8]		
Installed 200 hp.		150-400
Installed 400 hp.		125-340
Installed 800 hp.		105-265
Installed 1,600 hp.		100-220
Installed 2,400 hp.		95-205
Installed 3,200 hp.		90-195
Installed 5,000 hp.		80-185

*See also Table 1 of "Compressors," The Oil and Gas Journal, June 23, 1949, p. 223. †Range for average plants is 0.2-0.8 per cent. ‡Lowest cost is for electrical drives and highest for diesel engine drive. Gas engine driven equipment costs are a little more (56-60 per cent) than the average.

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4. Downs and Tait, Pet. Engineer, Ref. Annual 1954, p. D-12.
5. P.A.D. News Release, April 1952.
6. Chilton, C. H., Chem. Eng., June 1949, p. 97.
7. Unruh, E. W., Pet. Engineer, Ref. Annual 1951, p. D-3.
8. Elam, J. B., The Oil and Gas Journal, Dec. 10, 1955, p. 139.
9. Glass, D. C., "Coating . . . Costs," The Oil and Gas Journal, June 20, 1955, p. 133.
10. McLean and Haigh, The Growth of Integrated Oil Companies, Harvard Business School, 1954.

TABLE 2—COST (1946) OF PIPELINES, COMPLETE

	Oil lines[2,7,10]		†Gas transmission[2] total		†Gas field lines[2] total		
Diam., in.	Installed cost, $ per mile*	$ per mile per inch diam.§	$ per mile	$ per mile per inch diam.	$ per mile	$ per mile per inch diam.	‡Coating cost, $ per mile
2					3,200	1,600	
3					4,200	1,400	400
4	4,500 (3,000- 6,000)	1,120	6,000	1,500	5,200	1,330	658
6	8,000 (5,000-13,000)	1,250			8,300	1,390	850
8	12,000 (8,000-22,000)	1,500	12,000	1,500	11,800	1,470	1,000
10	16,000 (10,000-30,000)	1,600			15,000	1,500	1,150
12	20,000 (14,000-36,000)	1,670	18,500	1,550	18,300	1,520	1,300
14	24,500 (17,000-43,000)	1,750					1,450
16	28,500 (21,000-48,000)	1,780	25,500	1,600			1,550
20	37,500 (30,000-59,000)	1,880	33,000	1,650			1,750
24	47,000 (40,000-69,000)	1,960	41,000	1,700			1,900
26	54,000 (46,000-74,000)	2,080	45,000	1,725			2,000
30 est.	68,000 (58,000-84,000)	2,260					
36 est.	91,000	2,520					

*At least 125 pipelines. †Does not include land or land rights. ‡Varies widely. The cost of coating natural-gas lines with mesh and a 2-in. layer of barytes-laden cement is: 16-in. diameter, $11,500 per mile; 24-in. diameter, $18,000 per mile. The cost of coating actually decreased (Ref. 9) since 1946 due to improved methods, but equivalent 1946 costs are given here so that indexes based on 1946 can be used. §Reference 10 shows much lower costs for larger lines (above 14-in.) and higher costs for small lines. At 30-in. diameter the costs are lower by 35 per cent.

by Dave Vondy

SPHERICAL PROCESS VESSELS—3 PART 1

Spherical Design Gives Extra Separation Area

FOR a given level change in the vessel, a corresponding change in the pilot control gas occurs and is the same whether the level is high, medium, or low in the vessel. An increase in the average flow rate requires that the control valve open further which is only possible with increased control gas pressure. This can be obtained only with a rise of the average liquid level in the vessel.

In a vertical vessel, this rise has little effect on the surge capacity of the vessel. For a horizontal vessel, a given change in level involves considerably more liquid in the center of the vessel than toward the top or bottom.

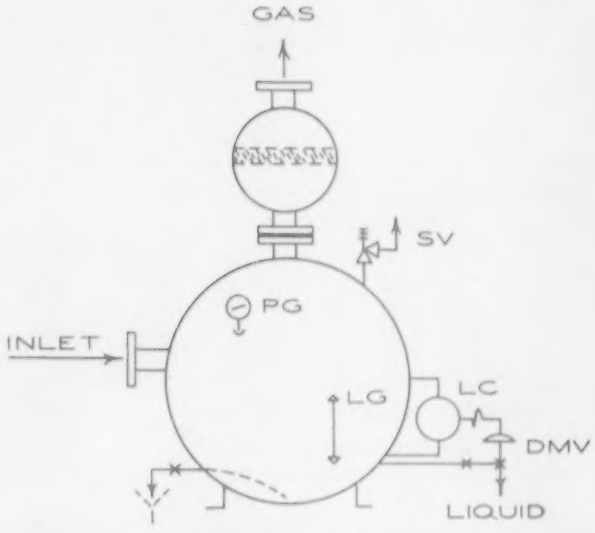
Surge space . . . More of the vessel volume is utilized for surge space than in the vertical vessel since controller response to a given change in quantity of liquid is greater toward the limits of the vessel than in the center. An increase in the average flow rate causes a level rise in the vessel. This rise will involve a considerably larger volume of liquid than in the case of the vertical vessel. A reduction in the surge capacity is the result.

The spherical vessel has an intermediate height and centerline cross-sectional area between the other vessels. A maximum of the vessel volume is available for surge service and yet the effect of a change in flow rate does not reduce surge capacity as much as in the horizontal vessel.

Also a vertical vessel is often unhandy especially if it must be elevated to provide ample liquid head to meet N.P.S.H. requirements of a pump. Thus the spherical vessel shows advantage in such applications as reflux, lean oil, heating oil, and surge tanks.

Vessel design . . . For a surge pot, spherical design is often most economical except for small low-pressure vessels. This design is obviously a natural for pressure-loaded accumulator tanks.

Author is with Constructive Engineering, Baton Rouge, La.



SPHERICAL SEPARATOR with external mist extractor (drain-back internal).

For a mist-extractor vessel such as might be required downstream from an absorber or compressor, there are several factors which must be considered such as: the type of element to be used, what shape it is, and how it drains.

Often the spherical design is the most economical for pressures above 250 psi. with the exception of a combination of high pressure and large capacity. For low pressures and high capacities it may or may not be economical. Suitable drainback or liquid-dump provision can be made.

For vessels to be used as reactors or adsorbers containing a packing, desiccant or catalyst, each design should be carefully examined because proper distribution of the process stream may be difficult to obtain. Usually it is necessary to leave a considerable dead space both at the top and at the bottom (vertical flow) to realize effective flow in the area immediately adjacent to the vessel wall.

From preliminary estimates, spherical design should prove practical in many cases. For hot or cold vessels, the smaller surface area of the sphere may significantly reduce objectional heat transfer and in some cases reduce insulation cost. Reduced insulation cost is not likely, however, because usually preformed insulation will not be available.

In case special material is required for the vessel shell, it will likely be necessary to check with the fabricators to verify that the spherical heads can be produced.

Liquid-liquid and multiphase separators require special considerations. A sphere presents considerably more area for primary separation than a vertical vessel but proper distribution for effective operation requires unique design. Often in design of this type of equipment, extra vertical height is incorporated to lengthen the time of retention.

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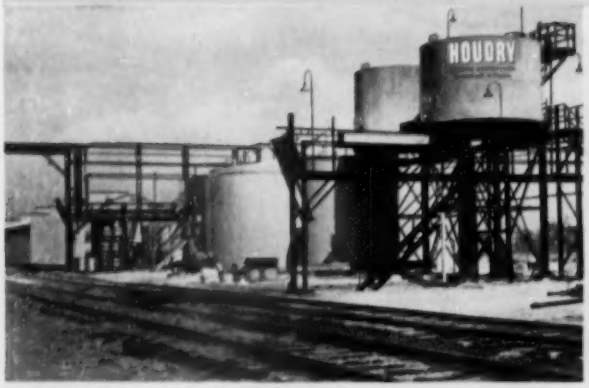
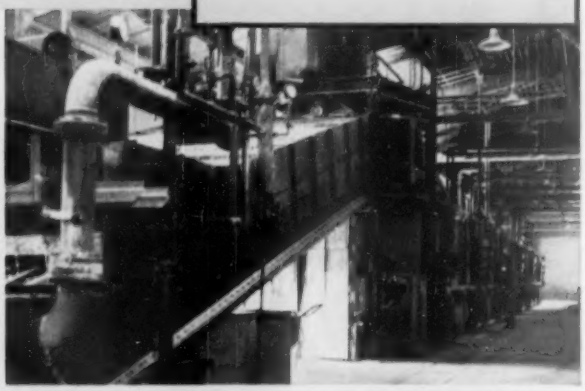
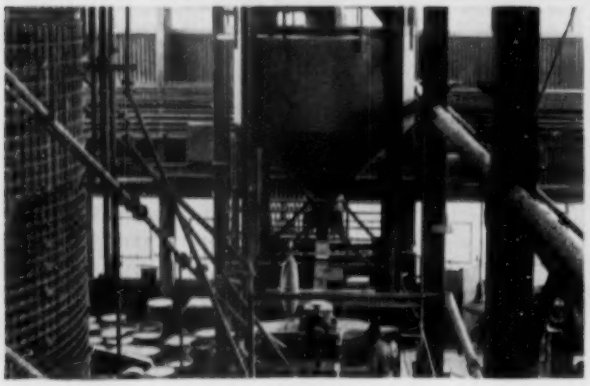
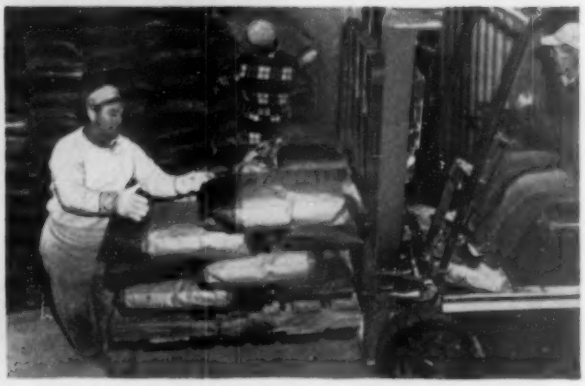
Metal content, wt. %, nominal	0.5	0.5	5.0	0.5
Na_2O, wt. % min.	0.1	0.1	0.1	0.1
Surface Area, $m^2/g.$	80	145	125	80
Bulk Density, kg./l	0.84	0.84	0.88	0.86
Knife-edge Hardness, g.	5,000	7,900	4,500	4,500

Houdry Chemicals Division will manufacture pelleted type catalysts to specifications . . . and will also assist in developing catalysts for special requirements. Additional information will be sent on request.









The Houdry Paulsboro, N. J., plant, built in 1940, was the first commercial plant in the world to produce synthetic cracking catalysts. In the past 16 years, facilities have been expanded to produce a general line of pelleted catalysts.

PAINTING STEEL—10

Phenolic Paint Is Recommended for Binder

by J. O. Jackson* and Joseph Bigos†

ALMOST any binder may be used, but it should have good water resistance and adequate wetting of the granules.

Quick-drying materials, such as vinyl paint, do not work because they dry too fast to permit application of the insulation. Any slow-drying paint or bituminous cutback may be used for binder, but a phenolic paint is recommended. Fire-retardant binder should be used where fire cannot be tolerated.

Water immersion . . . The best paints for practical use in protecting steel continuously immersed in water are the phenolics and the vinyls. The phenolics are often used even without blast cleaning, but on a blast-cleaned surface it is probable that the vinyls will outlast the phenolics.

For this service use Paint System Nos. 3 or 4 (Tables 8 and 9), but specify sufficient coats to build a film thickness of 5 to 6 mils. Bituminous coatings are used also. Hot coal-tar enamel is best; but if this is impractical, three to four coats of CA-50 coal-tar mastic may be applied, but not in potable water.

Chemical . . . Each chemical exposure must be analyzed and the protective system decided upon the basis of the degree of exposure (yard area or remote, close proximity but no direct contact, occasional spillage, direct immersion), the corrosivity of the environment toward the steel, the reactivity between the chemicals and the coating materials, the surface preparation which is permissible or economical, life expectancy required, and the like.

These chemical factors are discussed in Section 4, Chapter 16 of Volume 1.[2] This section includes a table which lists most of the commonly encountered chemicals and the degree of resistance which may be expected from the available classes of paint and coating materials. See Appendix to S.S.P.C.-PS 4-55T[2] for resistance of vinyl paints.

Most of the highly resistant materials have poor adhesion to steel or require clean steel surfaces free of rust, millscale, oil, grease or dirt. For paints, the degree of surface preparation that is required varies with the corrosivity. Poor surface preparation in very corrosive circumstances almost invariably leads to short protective life.

Steam cleaning may be used to great advantage to remove soluble corrosive salts, oil, grease, dirt, soil, etc., from the surface.

Blast cleaning to white metal is almost mandatory to obtain long service life in the extremely corrosive exposures.

In yard areas, or interiors exposed only to low concentration of fumes or gases, hand or power-tool cleaning may suffice.

Extremely corrosive conditions, such as complete immersion in strong acids, require linings. These may be of natural or synthetic rubber, baked or catalytically cured phenolics, furanes, or epoxys: these may be applied as cements or sheet linings. Grease or wax type of rust preventive compounds are often used where they can be replaced easily as necessary.

The vinyl paints are widely used for resistance to chemicals. They are quite inert and unaffected except, primarily to strong oxidizing agents or powerful solvents such as aromatics and ketones. They have a low upper limit of temperature. For complete immersion they may be applied in numerous coats to a thickness approaching linings.

Obviously the pigments must be chosen so that they do not react with the chemical. Aluminum is no good in contact with alkalies. Carbon black or titanium dioxide pigmented vinyls have good chemical resistance. Red lead has fairly good chemical resistance when used in the underlying coats.

Under highly acid conditions, zinc chromate should not be used. Completely inert pigmented paints should be used for all coats. Coal-tar enamel and coal-tar and asphalt mastics have good chemical resistance and are used extensively for structural steel work or exteriors of equipment.

Chlorinated rubber, neoprene, vinylidene chloride, styrene butadiene copolymer, and epoxys have good resistance and may be procured as proprietary paints.[1]

TABLE 7—Antisweat Coatings[1]

Clean and paint surface with phenolic paint: see PS 3 or 5.

Apply a thick, wet coat of paint.

Apply ground cork or vermiculite to the surface by blowing on, pouring on, or patting on by hand.

Repeat as necessary until desired thickness is achieved—about $\frac{3}{16}$ to $\frac{5}{8}$ in.

Insulation may be sealed with final coat of paint or left exposed.

For fire-retardant binder use MIL-P-15144A (Formula 34).

For vermiculite use MIL-V-15196 (Ships). S.S.P.C.-Paint 12-55T may be used as insulation: apply sufficient coats to build up required thickness of about $\frac{3}{16}$ to $\frac{1}{4}$ in.

TABLE 8—PAINT SYSTEM NO. 3, PHENOLIC PAINT SYSTEMS[3]

(For fresh water immersion, alternate immersion, high humidity and condensation, and weather exposure)

Paint System No. 3 has the same standard surface preparation requirements as Paint System No. 2. Phenolic paints are used for resistance to water. Standard primers include: Federal Specification TT-P-86a, Type 9 (extended red lead-phenolic); S.S.P.C.-Paint 5-55T (zinc dust-zinc oxide-phenolic); Federal Specification TT-P-57, Type 3 (red iron oxide-zinc chromate-phenolic); S.S.P.C.-Paint 6-55T (red lead-iron oxide-phenolic); S.S.P.C.-Paint 10-55T (iron oxide-zinc chromate-red lead-extender-phenolic).

The first two primers are excellent for potable water. S.S.P.C.-Paint 7-55T is an economical zinc dust-iron oxide alternate primer. Aluminum phenolic is the standard finish but phenolic finish alternates are included.

In fact, three or four coats of primer often constitute the entire underwater system. Oil or alkyd topcoats in P.S. 1 or 2 may be used for structures above water or exteriors.

Reference

1. Steel Structures Painting Manual.

2. Bigos, Joseph, "Good Painting Practice," Steel Structures Painting Manual.

3. Bigos, Joseph, "Preparing Specifications for the Painting of Steel Structures," Consulting Engineer, October 1955.

*Pittsburgh-Des Moines Steel Co., Pittsburgh. †Senior Fellow, Mellon Institute of Industrial Research. Paper presented at A.P.I. Refinery Division meeting, Montreal, 1956.

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3. **Iron content 0.2 parts per million**
4. **Turbidity 1 part per million**

Most operators agree that these standards for the flooding medium (water, produced brine, or both) are necessary for minimizing clogging of the input formation. INFILCO *complete* treating plants, which include the highly efficient ACCELATOR® Stabilizer, provide water within the specified limits. Closed systems, or other types of partial treatment, seldom meet these exacting requirements.

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5618 (OG)

NATURAL-GAS DESULFURIZATION—3

Small-Diameter Towers Used for Purifiers

by D. K. Taylor

IN case No. 1 we can assume that in the bed we have approximately 9 lb. of Fe_2O_3 per cubic foot of layer space. Due to the reviving reaction, and the fact that we have analyzed many, many samples of used material, we can safely estimate that this amount of iron oxide, in this volume, will absorb 22½ lb. of sulfur per cubic foot. This would apply before the amount of sulfur is sufficient to coat and insulate the oxide from further contact with the gas.

Knowing the amount of sulfur in the gas allows us to calculate the life of the bed. If all other of the above criteria produce a very small purifier, we still think its size should be increased so a minimum of 60 days' life may be enjoyed. Operators hate to go through the work of changing the material more often except in very large installations.

Large installations . . . Of course it is possible that in the very large installations we will have a set of multiple towers in parallel to get the proper area of contact. With very high pressures the economics of steel design make it more desirable to have a larger number of small-diameter towers rather than one very big one.

In case No. 2 where it is not possible for one reason or another to admit air to the gas even in very small quantities then only the sulfiding reaction may be used and this same sponge will absorb only approximately 0.6 lb. of sulfur per lb. of Fe_2O_3 or 5 lb. per cubic foot before passing a stain.

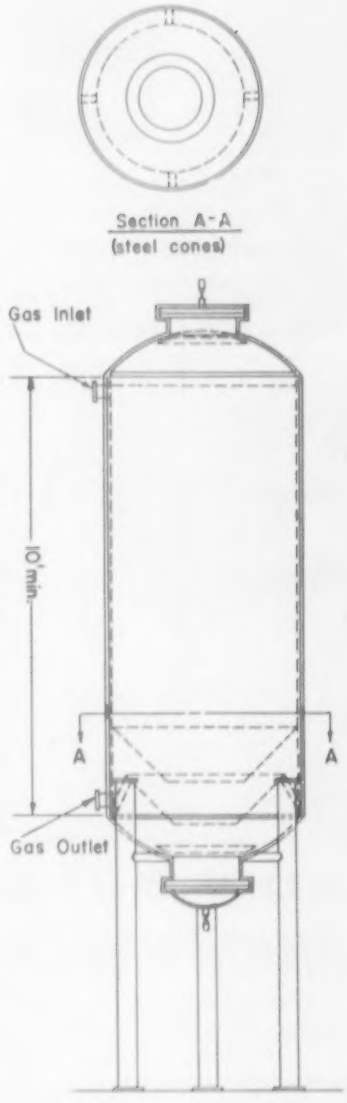
Author is western division manager, Connelly, Inc. Paper presented at Gas Conditioning Conference, University of Oklahoma.

In this latter case we have mentioned that the space velocity should be lower. When about three-fourths of the theoretical H_2S has been absorbed we recommend taking the tower off the line, bleeding it down to atmospheric pressure, and then recirculating the gas in the tower through a small blower. This provides for the addition of air on the inlet of the blower and the discharge of an equal amount of the mixture on the outlet of the blower.

Recirculation rate. . . . This should be from 0.3 to 0.6 cu. ft. per minute per cubic foot of sponge bed. The oxygen content in the circulating gas should be gradually built up to about 8 per cent. Thermometers watching the outlet temperature, and an Orsat to check the O_2 content are necessary.

Usually the reviving job may be completed in 6 to 8 hours and the tower put back on line for another fouling. Some believe that with this latter method, it is best to use Grade C1 sponge which contains 15 lb. of Fe_2O_3 per bushel. The time between reviving periods is slightly longer. Against this, however, must be weighed the fact that the sponge costs more and that eventually when the amount of sulfur builds up to about 22 lb. per cubic foot it coats the iron oxide with a consequent wastage of iron oxide.

At the other extreme is the operation at Birmingham, where they prefer to use a light-grade sponge containing only 6½ lb. of Fe_2O_3 per bushel.



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Among the
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Texas Contractors Get Slash in Insurance Rate

The improved safety record of Texas drilling contractors during the past 2 years is being rewarded by a substantial reduction in the manual rate for workmen's compensation insurance.

Approval of the reduction, amounting to 7 cents per $100 payroll, was given by the state insurance department at its annual rate hearing. It is estimated that savings for the state-wide drilling industry will amount to more than $100,000.

Joseph M. Shelton, insurance consultant, in a letter to members of the American Association of Oilwell Drilling Contractors, points out that the reduction in manual rate for the drillers contrasts with the 1.3 per cent increase for oil classes generally.

Workmen's compensation rates applicable to contract drilling in Texas have declined steadily from the 1952 high point of $10.05 per $100 of payroll to the new mark of $8.59 set during the last rate hearing. Rates are based on the previous 2 years' accident experience.

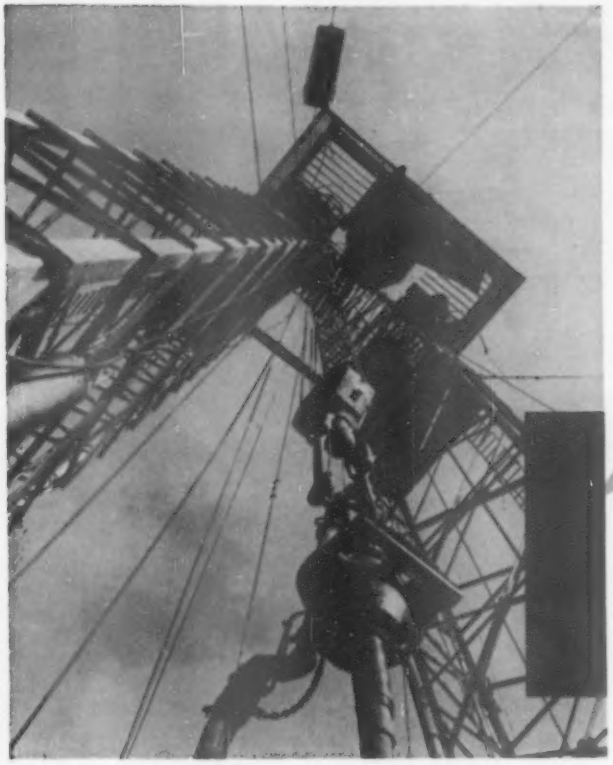
Hugh Kirkpatrick has a rig working for Claud B. Hamill and associates, of Houston, at a wildcat location 6½ miles south of Delamita, in northeastern Starr County, South Texas. It is an 8,500-ft. test, carried as 1 Bentsen Brothers, with location in Section 6, El Benadito Grant.

Hughey Drilling Co. has a new wildcat operation in Anderson County, East Texas. It is a contract job for Talbert & Gulley and others at 1 Pine Lodge, in the Phillips Martin Survey, 3 miles east of Elkhart. Contract is for 6,000 ft.

Sharp-Gulf Drilling Co. will drill a 12,500-ft. test for Natural Gas & Oil Co. at a wildcat location 3 miles southeast of LaRose, in Lafourche Parish, southeastern Louisiana. Location is on the Dixie Lafourche Club land, in 52-17s-21e. It is 2½ miles north of Cut Off field.

C. B. Webster Drilling Co., Houston, has taken on a contract for a deep test to be drilled in Vermilion Bay, offshore from Iberia Parish, Louisiana. Cities Service Production Co., the operator, is planning for a 16,000-ft. test. Location is on State Lease 2903, about 8 miles southwest of Wake Island dome. Webster also is getting under way on a new test of its own in St. Landry Parish. It is an 8,950-ft. wildcat, located at 1 McGee and others, in 23-

TOUR CHANGE on a rig operated by Brown & Scarber Drilling Co., Inc., of Wichita Falls, Tex., in Sharon Ridge field, west of Snyder, in Scurry County, West Central Texas. Going off tour, daylight crewmen (front row, left to right) are: Joe Roper (driller), Bob Whitaker, F. O. Taylor, and Don Hohenstein. Coming on tour, evening crewmen (back row, same order) are: Leo Kennedy (driller), W. D. Blythe, Allen Cole, and Monte Mac Humphrey. Rig has been drilling under contract for Texas National Petroleum Co.



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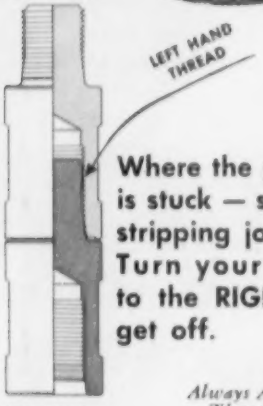

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6s-1e, 1½ miles south of the Eunice area, and about 2 miles northwest of Savoy field.

Haney & Williams Drilling Co., Los Angeles, is operating General Petroleum Corp.'s new 176-ft. self-propelled core-drilling ship on operations in the Pacific Ocean off California's coast.

J & C Drilling Co., Refugio, Tex., is getting under way on a 6,000-ft. test for **Layton Brown Drilling Co.,** of Woodsboro, Tex., at a wildcat location, 1 Burditt, 4 miles southeast of Petronilla, in Duval County, Southwest Texas. Location is in Lot 5, J. E. Garrett Survey.

Miller Brothers, Alice, Tex., will drill a 6,500-ft. wildcat test 6 miles northwest of Sinton, in San Patricio County, South Texas. It is a contract job for American Petrofina, Inc., at 1 Castillo, in the K. T. Eirvin Survey.

Delta Drilling Co., Tyler, Tex., is starting an 8,150-ft. Frontier test in the East LaBarge area, in Sublette County, western Wyoming. It is a contract job for John L. Kemmerer at 2-A Government. Location, a wildcat, is 2 miles northeast of LaBarge.

Wheless Drilling Co., Shreveport, has a new deep operation scheduled in the Roanoke area, Jefferson Davis Parish, southern Louisiana. It is a contract job for W.W.F. Oil Corp. and Lyons & Logan. Location is for 1 Thomas, in 11-9s-4w. It is on the west side of the present producing area and is set up to go to 11,500 ft. Deepest production in the field is about 9,500 ft.

Sun Marine Drilling Co., affiliate of **San Joaquin Drilling Co.,** Los Angeles, will man the new Pacific Drill No. 1, the West Coast's first gulf-type drilling platform for offshore operation. It is slated to go to work in 60 ft. of water on a lease held jointly by Monterey Oil Co., Humble Oil & Refining Co., and Seaboard Oil Co. Location is a mile offshore from Huntington Beach, in the Pacific Ocean.

Crow Drilling & Producing Co., Shreveport, has a rig under contract to American Liberty Oil Co. for a deep test in southwestern Warren County, western Mississippi. Its location, at 1 Hyland, in 17-14n-2e, is about 1¾ miles southwest of Yokena, and about 15 miles south of Vicksburg. Plans call for a 9,600-ft. test. Frankel & Frankel and E. C. Johnston & Co. are associated with American Liberty in the venture.

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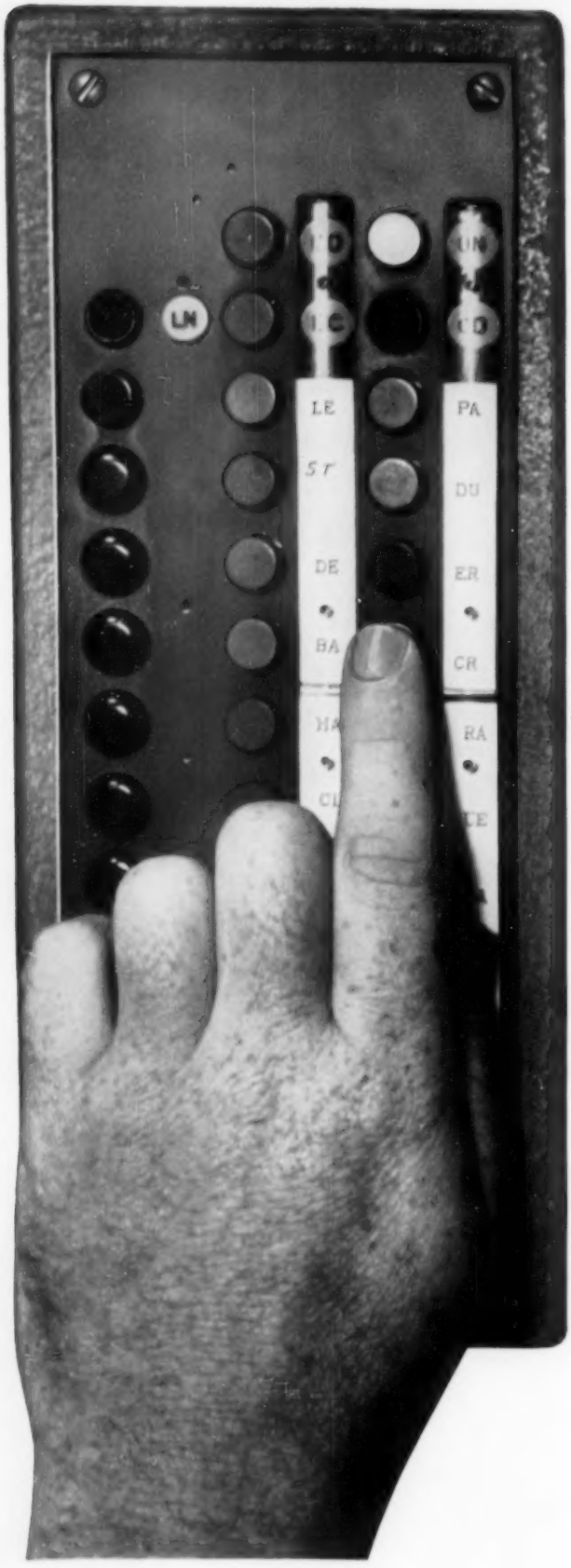

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Centrifugal Compressors—4

Compressors set pipeline flow rate

FIGS. 14, 15, and 16 show, for the ultimate condition, the characteristics of three compressors in series, two compressors in series, and a single compressor, respectively.

It is very important that all operating conditions which may occur be considered before the compressor characteristic is finally selected. Referring to Fig. 12[1] for the initial design, the 130-mile line shows where operating points would fall for various flows with all stations running.

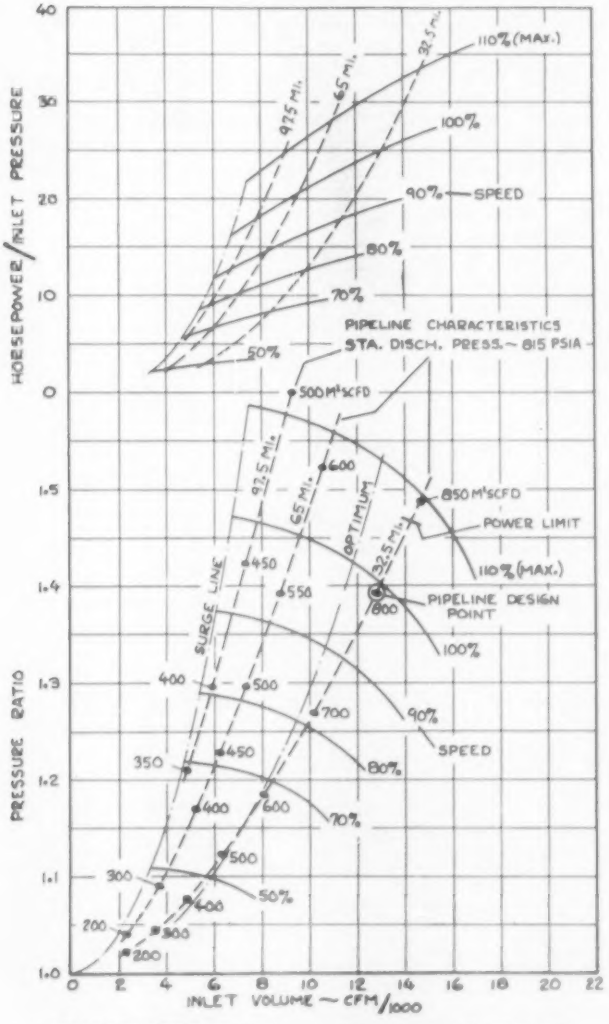
The 260-mile line shows operating points with only alternate stations running. These operating lines are obtained directly from Figs. 10[1] and 11[2].

Maximum flow, with all stations running, is established by the power limit (115 per cent or 5,750 hp.) and maximum flow with alternate stations running is established by the speed limit (110 per cent).

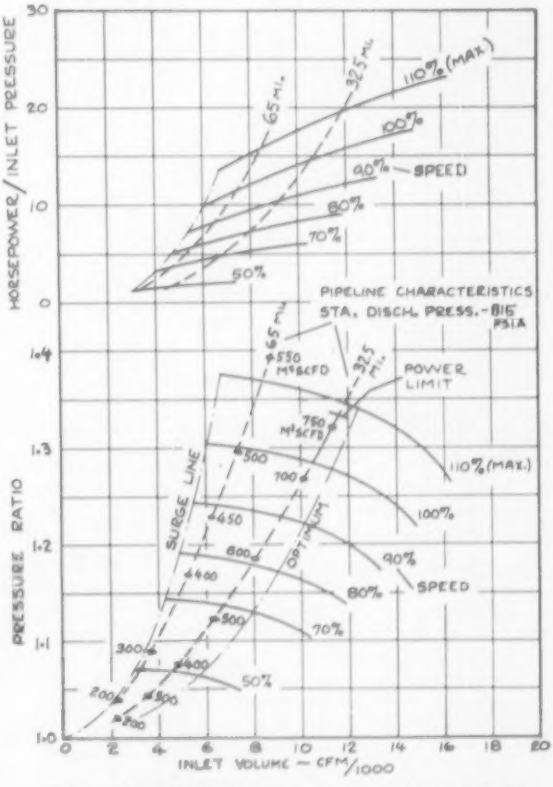
Where multiunit stations are used there are more possible combinations of compressors. Figs. 12 and 13[2], showing the performance of compressors for the intermediate condition, illustrate typical operating points to be checked in order to insure that the proper compressors are selected for this phase of the pipeline growth.

Pipeline characteristics for 65 and 130-mile spacing from Figs 8 and 10 are shown on both the single and two-unit curves. Figs. 14, 15, and 16 show the performance of the compressors selected for the ultimate operation of the pipeline. Pipeline characteristics for different station spacings are again superimposed on the compressor char-

Material furnished by C. F. Koenig III, and L. J. Holveck, De Laval Steam Turbine Co., Trenton, N. J.



CHARACTERISTICS of three compressors in series. Fig. 14.



TWO COMPRESSORS give these characteristics. Fig. 15.

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acteristics to show quickly the operating points at various flows.

Surging . . . No discussion of the centrifugal compressor would be complete without some comment on surging. Any centrifugal compressor or, for that matter, any compressor which accomplishes its compression by the dynamic action of moving blading, will exhibit decreasing pressure with increasing volume in the stable range (negative slope) and instability occurs where the slope of the curves becomes positive.

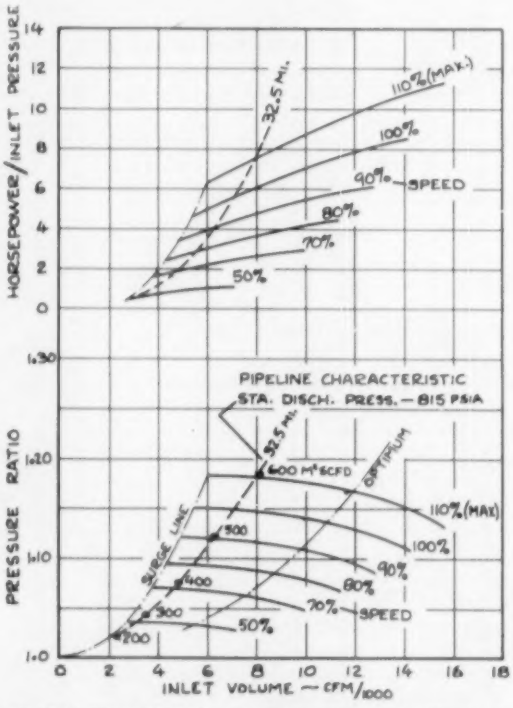
When, at a given pressure ratio, the flow drops below the stable operating range of the compressor, the pressure drops suddenly and surging sets in. The violence and frequency of surging depends on the design of the compressor and the size, length, and configuration of attached piping. Surging usually is accomplished by fluctuations of some magnitude in gas pressure and perhaps some vibration of the compressor. Normally, it is not destructive in pipeline compressors but is to be avoided wherever possible.

Centrifugal compressors are designed for maximum operating pressure and maximum flow of the pipeline. During periods of light load, the flow often drops below the stable operating range of the compressor if the maximum line pressure is maintained. Since the compressor sees only actual volume, it is possible to maintain stable operation at reduced flows by lowering the pressure level of the line.

INSTRUMENT BOARD used with centrifugal compressors in pipeline stations.

Thus, if a compressor is designed for 1,000 M.M.s.c.f.d. of gas at 700 psi., the actual inlet volume would be approximately 13,000 cu. ft. per minute and the compressor would still be operating at its design volume, although the power would be less.

Speed reduction . . . A somewhat dif-



CHARACTERISTICS for one compressor with ultimate design. Fig. 16.

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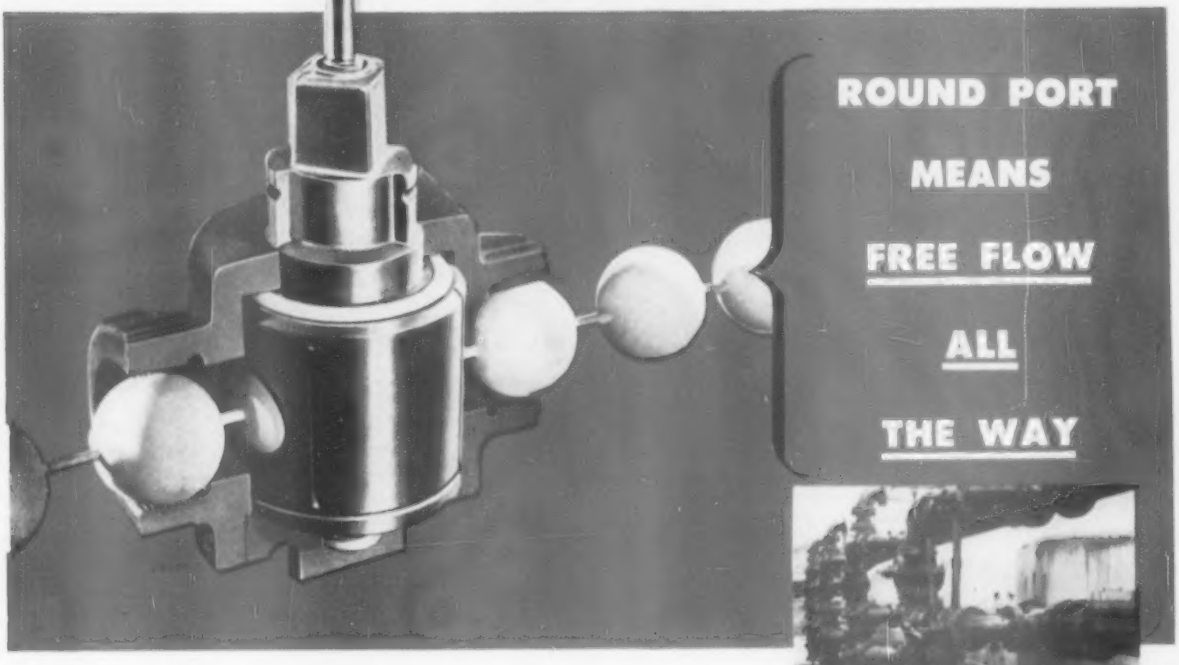

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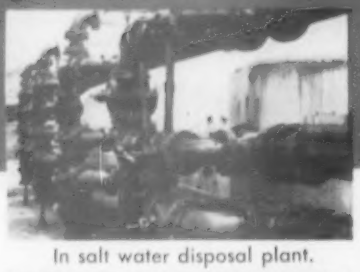

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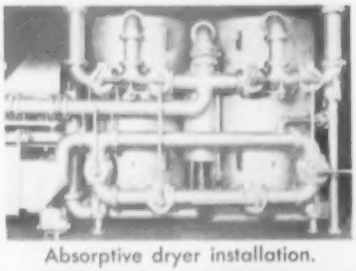

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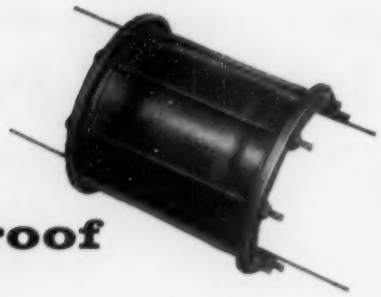

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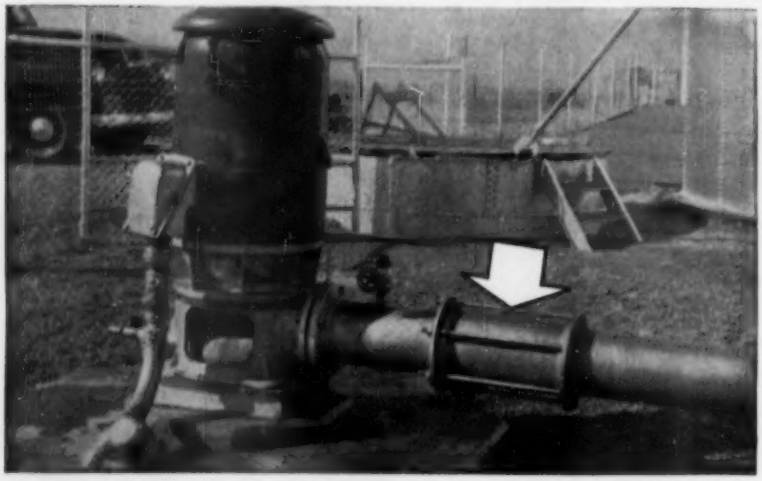

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ferent cause of surging is a very rapid reduction in speed. If the speed of the compressor is reduced rapidly, the compressor discharge pressure will fall more rapidly than the downstream line pressure and the compressor will be forced into surge until the downstream line pressure has been bled down to discharge pressure of the compressor.

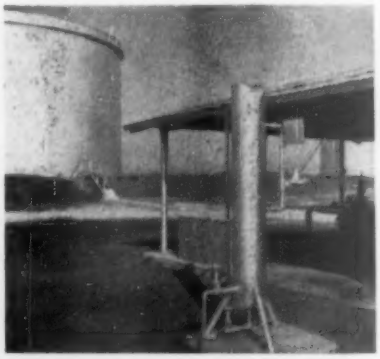
This situation can be avoided by reducing speed gradually. By the same reasoning, increasing the speed of the compressor tends to move the operating point further into the stable range, and it is not necessary to exercise the same degree of caution as in reducing speed.

Summary

The centrifugal compressor is still relatively new in the pipeline field, but it is hoped that this presentation shows that in the hands of a trained operator, it can do much to ease some of the more serious problems faced by the industry.

References

1. The Oil and Gas Journal, November 19, 1956, pp. 273-76-78.
2. The Oil and Gas Journal, November 5, 1956, p. 140.



Automatic Shutdown Unit Mounted on Scrubber

ON its Monument pipeline station in Lea County, New Mexico, Shell Oil Co. has a time clock for shutting down the unit mounted on the low-pressure line on the gas scrubber.

Gas enters from the field lines near the bottom of the scrubber and condensate is drained from the bottom. The center of the vessel has a plate welded across it and the regulator and time-clock line are connected across this plate. Therefore gas is scrubbed again after the pressure is reduced.

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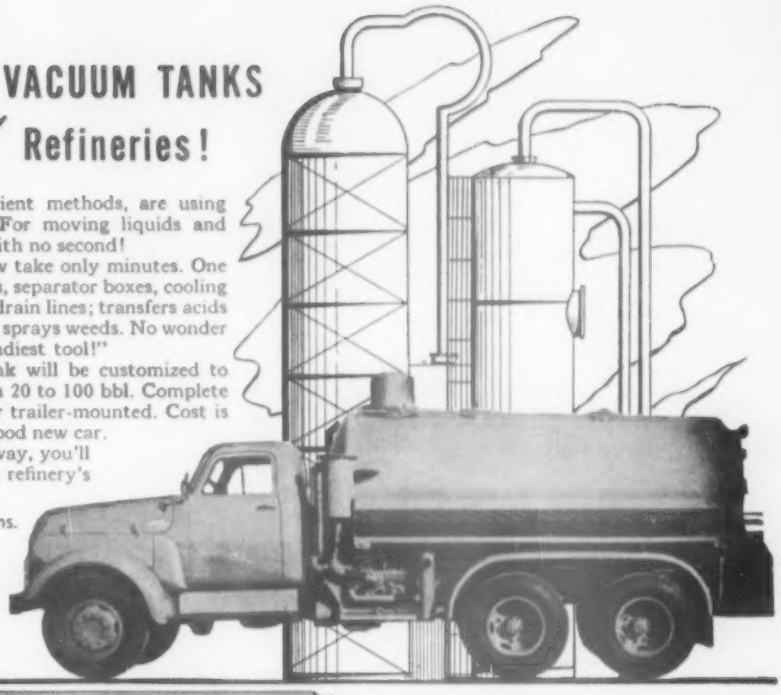

This is a 45-bbl. Thompson Unitized Vacuum Tank mounted on a GMC truck. This complete, mobile unit, operated by one man provides speed and economy for a host of liquid and semi-solid handling jobs at the world's most modern refinery.

New Model WT50 now available. A complete unit that can be truck-mounted in your own shop. Write for specifications.

THOMPSON
TANK and MANUFACTURING CO. Inc.
2019 EAST WARDLOW RD. LONG BEACH 7, CALIFORNIA

SOLE LICENSEE TO MANUFACTURE VACUUM TANKS UNDER U.S. PATENT NO. 2522077

MUD MIKE says:

Put that kitchen sink back—
You haven't tried **PALCO SEAL** yet!

During the past 20 years, more and more experienced mud men have given up throwing "everything but the kitchen sink" into the mud. They try PALCO SEAL first, because it's just the right combination of slender and chunky fibers to stop circulation losses. It stays in suspension better than kitchen sinks—and pumps easier, too! P.S.: PALCOTAN is the coming chemical, too, for low cost control of viscosity, gel strength and water loss.

Write for details.
Available through oil field and mud service organizations

THE PACIFIC LUMBER COMPANY
100 Bush Street, San Francisco 4, California

EXPLOSION PROOF MOTORS

Continental ELECTRIC MOTORS

PLANTS:
17 Main St., Newark 5, N. J.
1240 Harrison Ave., Rockford, Ill.

BONUS FOR DRILLING CONTRACTORS

That's what your Goodall rotary hose is — a bonus for drilling contractors. Twenty years ago the Barney Coupling was developed by Goodall and today it is still the only coupling which can be re-set to make damaged hose as good as new. This means a bonus for you in that a Goodall hose when damaged can have the couplings re-set by the Goodall repair service for future use as rotary hose or in shorter lengths as vibrator hose.

The Barney Coupling, while it is probably the greatest single development in rotary hose manufacture, is only part of your bonus when you buy Goodall rotary hose. You also get the exclusive Goodall guarantee, the Goodall Safety Clamp and the Goodall repair service.

GOODALL RUBBER COMPANY

TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Odessa, San Angelo, Texas.
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
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STOCKING DISTRIBUTORS: Texas and Louisiana—Houston Oil Field Material Co., Wilson Supply Co., Hunt Tool Company, Heap Equipment Co.; Oklahoma—Iverson Supply Co.; Kansas—Mountain Iron & Supply Co.

The OIL AND GAS JOURNAL

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OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

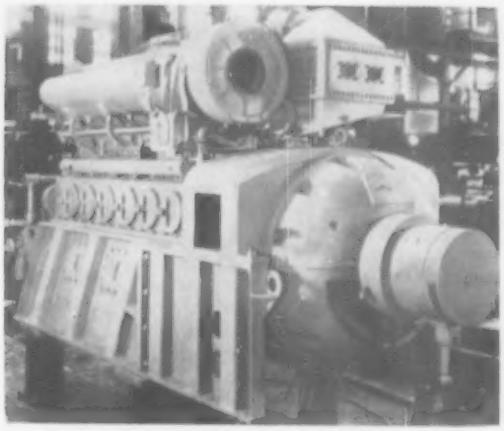
Unit Meters and Separates Oil-Well Production

An oil meter and separator in one integral unit gives continuous information on the quantity of production while performing the regular separator functions. The metering separator features the new neutral-position three-way meter valve. This valve has a dead-center position, which permits only one of the two inner ports to open at any given time. This allows more accuracy in metering readings since nothing slips by the meter during valve switching.

The metering separator employs a stainless-steel-mesh mist extractor. To insure metering accuracy, upper and lower liquid levels are controlled in reduced-diameter necks. The compact unit also provides low-maintenance operation, and a new counter system.

The data available with metering separator is required for maximum ultimate recovery. For example, the unit warns the operator of excessive gas-oil ratios, thus permitting him to take

remedial action before incurring penalties and suffering loss of reservoir oil. Accurate production information also is vital in determining the need for stimulation treatment. **Write or call: Rolo Manufacturing Co. for more information on Rolocheck metering separator.**



Compact Diesel Provides 400-1,400 Hp.

The W9 engine is designed as a source for auxiliary or main power at peaking or continuous levels for industrial power requirements. This small, heavy-duty, four-cycle, diesel provides 400-1,400 hp. for power in utility service, chemical and petroleum plants. Fully assembled upon delivery, the W9 is ready to be placed upon its foundation and requires no major aligning. The alignment is done at the factory, minimizing installation time and expense.

Constructed for continuous operation, the W9 gives power for high-output, turbosupercharged operation. The Jet-Swirl design swirls the air as it enters the cylinder. This assures a rap-

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Described in the Dec. 3, 1956, issue of The Oil and Gas Journal

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

DATE _____

id mixture of the air and fuel which results in efficient and clean combustion. **For more information write or call: Engine Division, Worthington Corp., P. O. Box 953, Buffalo 5, N. Y.**

●

Device Measures Flow Rate To 75,000 Cu. Ft. Per Hour

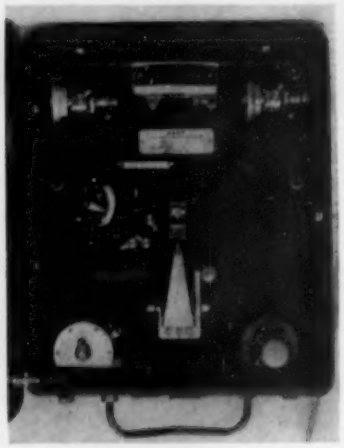
A new design of the Flo-Scope, an instrument for measuring flow rates of air and gases, Series F, incorporates design changes which reduce installation costs by permitting one-man panel mounting and reduce maintenance costs by simplifying cleaning procedures. Streamlined in appearance, Flo-Scopes handle capacities up to 75,000 cu. ft. per hour of air. Continued accuracy is assured because the only moving part is not subject to wear. Every Flo-Scope is individually calibrated at customer's specified flow conditions.

Flo-Scopes are useful for measuring flow rates of air and gases, separately or in mixtures, for combustion in furnaces and ovens. They also measure components entering special atmosphere-generating units, in the production of industrial chemicals and wherever flow-rate measurement of gaseous materials is required at numerous points. **For more information write or call: Selas Corp. of America, Dresher, Pa.**

●

Pressure Controls Mount On Wall, Panel, or Post

A new line of seven slack-diaphragm-operated pressure controllers are of the nonindicating, nonrecording, blind-setting type. They comprise suction or pressure controllers, including a special-purpose furnace-pressure controller differential-pressure controller; and an air-flow controller or differential-pressure transmitter. All the instruments are suitable for wall, panel, or post



mounting. A gage indicates the supply and control air pressures of the controlling circuit, expressed as percentages between minimum and maximum range.

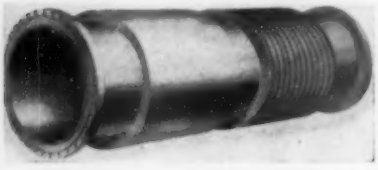
The instrument case encloses an air-reducing valve, a relay, and an auto/manual switch. All of the instruments are designed to operate with the diaphragms in the midposition, corresponding to a 9 psi. output of the 3-15-psi. controlling unit. The desired-value setting of all the controllers is easily adjusted. The only maintenance required by these controllers in use is the occasional removal of condensation from the filter sump of the controlling unit. **For more information write or call: George Kent, Ltd., Luton, Bedfordshire, England.**

●

Expansion Joints Rated As To Pressure and Temperature

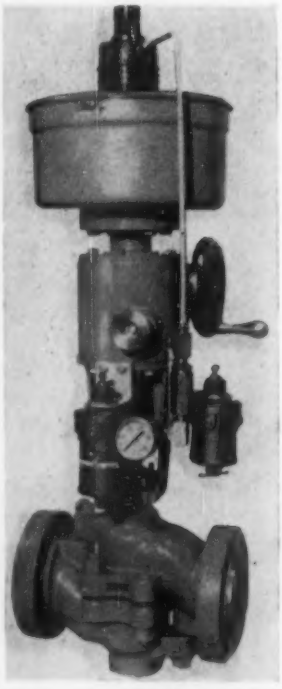
A redesigned line of packless corrugated expansion joints finds use in power, heating, industrial, and process-piping applications. They are available in several types classified in series according to the pressure and temperature conditions. Thus, joints in Series 50 are for lower line pressures while joints in Series 150 and higher are for higher pressures.

Fabricated from wrought steel, reinforcing rings are light and are able to withstand high pressures and temperatures. All joints are available with flanged or welded ends in any weldable alloy including stainless steel, Monel, Inconel, and nickel for pipe diameters from 3 to 72 in. They are equipped with internal liners which streamline the flow through the joint thereby minimizing turbulence and the high-frequency vibrations that result.



The joints are also available in hinged, tandem, or balanced models for installations in pipelines subject to angular or lateral movement alone or in combination with axial movement. Double joints are available for applications where axial movement is in excess of the amount that can be accommodated by a single joint. **Write or call: Badger Manufacturing Co., 230 Bent Street, Cambridge, Mass., for more information on packless corrugated expansion joints.**

●



Handwheel Operator Used When Air Fails

The Cono-Clutch handwheel operator is an integrally mounted accessory for the company's standard line of cylinder Conomotor actuators. The cylinder Conomotor, a pneumatically positioned power actuator, is used for throttling control on numerous types of valves, motor-driven speed changers, propor-

DRILLING SPECIALTIES COMPANY

BARTLESVILLE, OKLAHOMA

October 8, 1956

21,435' DEEPEST YET

ENGINEERS FIELD REPORT
By Frank J. Shell

Subject: Richardson and Bass
Deep Well Squeeze

Not too

On October 3, 1956 the Richardson and Bass well - Humble LI & E-SL2414, No. 1-L, Lake Washington, Louisiana was successfully squeezed at the interval 21419-35 feet, log temp. 326 F, with cement containing 1.5% Diacel* LWL to provide at least 3 1/2 hours thickening time. At the request of the operator, Richardson and Bass, we assisted in the formulation of the cement and were present to observe the operation. This is a report of the cementing operations.

ROUTE	
JCH	✓
DFB	X
AVW	✓
RSW	✓

An equivalent 300 sack batch consisting of 195 sacks of Unaflo cement, 13650 pounds of barite, and 275 pounds of Diacel LWL was slurried to a density of 17.4 ± 0.2 lb/gal. The slurry was quite fluid in the tub and no difficulty was experienced in pumping. During the mixing operations the slurry was pumped under a pressure of 6500 - 7000 psi and displaced with 18.3 lb/gal Magnolia surfactant mud with 6500 psi. Owing to the small capacity of the 2-inch tubing the cement could be mixed more rapidly than it could be pumped. It was necessary therefore to mix the slurry in batches of about 5 sacks and pump continuously. This accounts for the long mixing time (38 minutes) and the density fluctuations.

The formulation was squeezed through a Baker RT-8 retrievable cementing tool. After the tool was in the hole 4600 psi was required to break circulation. The tool was set with 40,000 pounds pull. Halliburton Oil Well Cementing Company equipment was used for mixing and pumping the cement.

Cement was mixed with fresh water at its normal temperature in 38 minutes. One bbl of water was pumped after the cement and followed with mud. The squeeze tool was closed 52 minutes after mixing started. Cement started out 63 minutes after mixing. The job was complete 3 hours 38 minutes after start of mixing. An estimated 25 sacks of cement was intentionally left in the drill pipe.

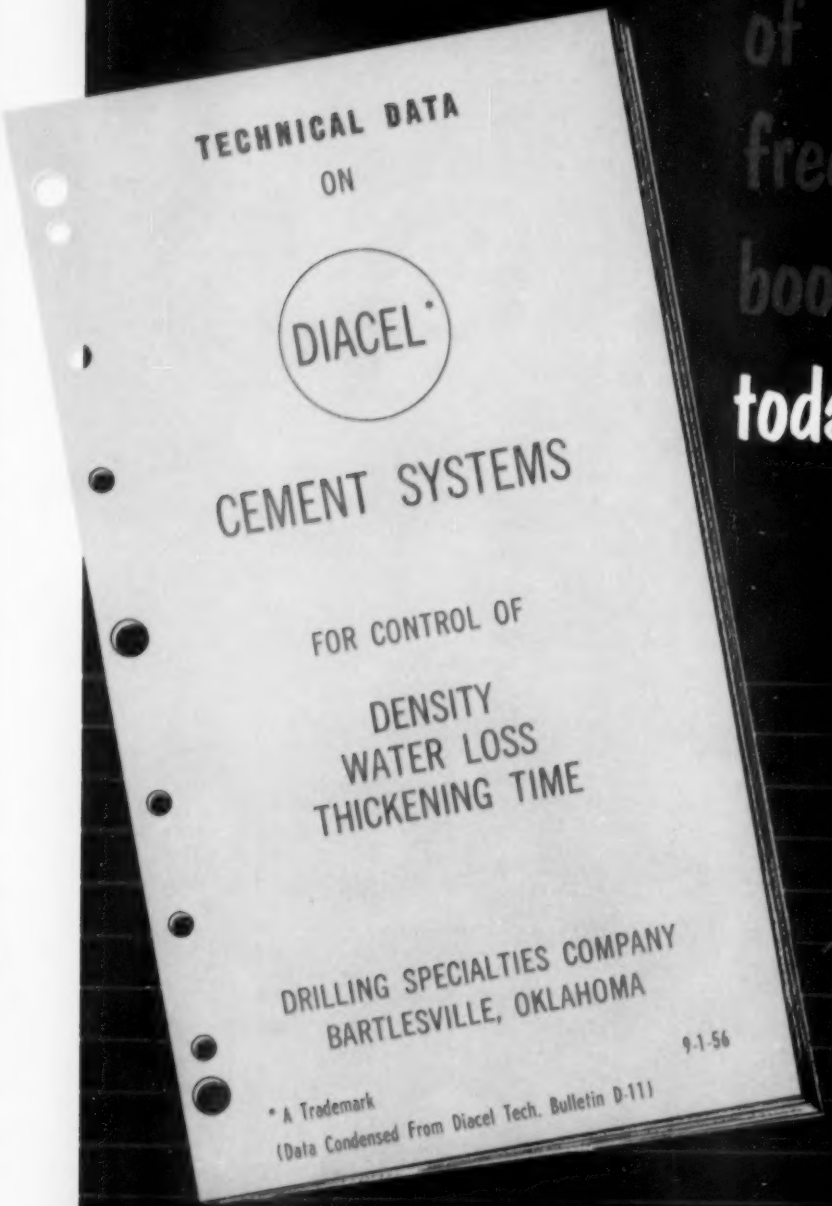
The operator considered the squeeze operation a success and plans to use Diacel LWL in subsequent squeezes on this well.

F.J.S.

FJS:mm

*A trademark

write for your copy of this free booklet today!

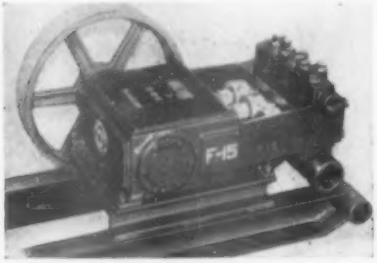


DRILLING
SPECIALTIES
COMPANY
BARTLESVILLE,
OKLAHOMA

tioning pumps, flow regulators, rheostats, and autotransformers.

The Cono-Clutch hand operator affords immediate manual control in the event of air failure. It can be instantly thrown in and out of gear at any position of the stem travel. Clutching and declutching are accomplished simply by pulling or pushing a knob conveniently located on the face of the unit. No special tools such as pins, latching devices, or hand cranks are required. When the handwheel is in declutch position, there is no interference with full and free stem travel. All gears are enclosed eliminating the possibility of dust and grit clogging the gear mechanism. Alemite fittings are easily accessible. **Write or call: Conoflow Corp., 2100 Arch Street, Philadelphia 3, Pa., for more information on Cono-Clutch handwheel operator.**

●



New Triplex Pump Ranges From 500 to 2,520 Psi.

A line of triplex pumps now includes the F-15, smallest of four plunger pumps with strokes of 2 to 5 in. Applications for the F-15 include water-flooding and salt-water disposal.

Performance rating can be varied from 6 to 15-hp. outright with discharge pressures of 500 to 2,520 psi. Capacities range from 4.1 to 51.7 gal. per minute, depending on plunger size and speed of operation. The pump is available with cylinders for either corrosive or noncorrosive fluids. **Write or call: The National Supply Co., 2 Gateway Center, Pittsburgh, Pa., for more information on F-15 triplex pump.**

●

High-Pressure Gas Filter Protects Process Equipment

This high-pressure gas filter removes contaminants from gaseous streams. It protects turbine expanders, compressors, pumps, nozzles, and blowers in process industries.

The resin-impregnated-cellulose filter elements have a 99 per cent efficiency rating when tested with U. S. Standard Test Dust (Fine). They are convoluted for extended area. An expanded-metal

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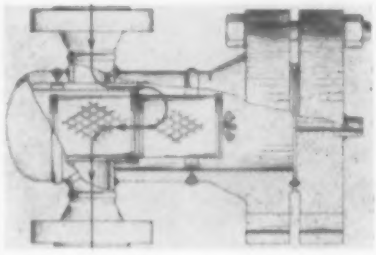
.....OF NEW EQUIPMENT



outer cover makes heavy-duty applications possible. The filter-element housings meet A.S.M.E. Boiler and Pressure-Vessel Code Specifications. **For more information write or call: Purolator Products, Inc., Rahway, N. J.**

●

New Tubing Head Allows Single or Dual Completion

A universal tubing head allows an operator to dually complete a well even though only a single completion originally was planned. The new head is adaptable to any completion practice using either single or dual tubing strings. These changeovers are possible without changing tubing heads or ordering special adapter spools.

Two retractable aligning screws are supplied to orient dual hangers with respect to the head itself. These aligning screws may be retracted when single string hangers are used. All hangers may be landed and locked in place through blowout preventers, insuring complete control of the well during the completion operation. All seals, in both hanger and head, may be pressure-tested by injecting fluid through a single test port in the adapter flange.

The universal head is available in all series from 600 through 2900 and flange sizes from 6 through 10 in. An adapter spool is available for those cases where the operator does not want to remove the existing tubing head. **Write or call: Oil Center Tool Co., 1912 Airline Drive, Houston 9, Tex., for more information on the universal tubing head.**

●

New Diesel-Engine System Lowers Fuel Consumption

A new balanced-pressure precombustion system for small diesels tolerates wide variation in fuel quality and reduces fuel consumption. This system equalizes pressures in the precombustion chamber and the main combustion space. It keeps the peak-firing pressure down to 925 psi. It lowers the speed of pressure rise to 28 psi. per degree of crank angle. This lowered speed cuts down on noise. The knock in many diesel engines when idling is also cut down.

The new system will accept any fuel, without modification of the engine, pro-

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Described in the Dec. 3, 1956, issue of The Oil and Gas Journal

NAME _____ **TITLE** _____

COMPANY _____

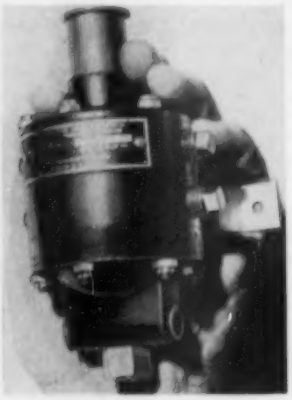
ADDRESS _____

CITY _____ **STATE** _____

DATE _____

duced in a distillation up to 950° F. This includes gasoline of any octane number, kerosine, gas-oil, marine diesel fuel, and lubricating oil without the need of fuel additives. **Write or call: Motoren-Werke Mannheim A.G., Mannheim, Germany, for more information on the balanced-pressure precombustion system.**

●



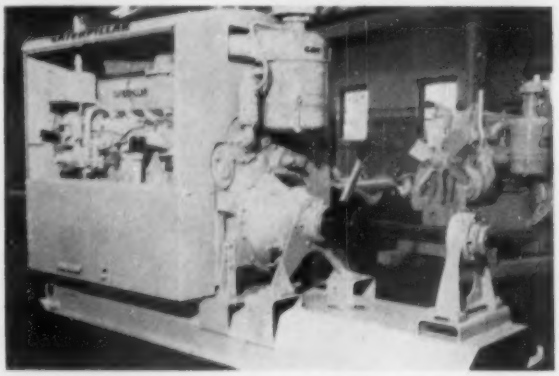
Differential Transmitter Checks Steam, Water, or Air

The new 200TD fixed-range differential transmitter checks steam, water, or air flow. It is designed as an economical instrument in plant process control where more expensive control equipment isn't economical. The 200TD can be used to check liquid level, consistency, or low-pressure air or gases (up to 10 psi.) requiring sensitive-transmission readings to an indicating or recording instrument.

The 200TD measures 6½ by 3 in.; weighs 4½ lb.; can be pipe-mounted; all connections ¼-in. internally threaded. A wrench and screw driver can install and adjust it on stream for zero. Its diaphragm is neoprene-impregnated nylon. Body material is brass. Maximum working pressure, 150 psi.; temperature 150° F. Air-supply pressure 20 psi. Air consumption, 0.10 standard cu. ft. per minute. Output-pressure range is 3 to 15 psi.

Calibration accuracy is better than 1 per cent. Sensitivity exceeds 0.1 per cent. Ranges: 0 to 50, 100, 200, and 300 in. of water. It can be mounted indoors or outdoors. **Write or call: Taylor Instrument Cos. for more information on 200TD fixed-range differential transmitter.**

●



New Engine Base Withstands Skidding

A new wrap-around base and fuel-tank combination has been developed for use with Caterpillar diesel-power units and electric sets. The new bases have been designed for use with all Cat engines and electric sets from the D311 through the D342. Models presently in production include extended and short-base model for the Cat D337 (Series F) and Cat D326 (Series F) engines, a short-base model for the Cat D318 engine and electric-set bases for Cat D311 and D315 diesel-electric sets. The new bases will replace the steel-channel models formerly used. The streamlined, space-saving design will feature a greater fuel capacity, lighter weight, and sturdier, more rigid construction.

Primary advantage of the new bases is the ability to withstand the stresses and strains of skidding and dragging. Strength and rigidity enable them to resist the bending and flexing to which power units in the field are subjected. **Write or call: Caterpillar Tractor Co., Peoria, Ill., for more information on new bases for engines and electric sets.**

●

Engine Preheater Circulates Coolant Within 20 Seconds

Keeping vehicles on the road through the elimination of cold-weather freeze-ups and hard starting is assured fleet operators through the use of the new Zero-Start external-tank engine preheater. Available in two models, standard for automobiles, heavy duty for trucks and heavy equipment, the unit is quickly installed on any liquid-cooled engine by connecting to the block drain. Circulating coolant within 20 seconds, the heater moves warm water freely throughout the entire block and into the cab heater for instant comfort.

The Zero-Start tank heater operates off any 115-volt a.c./d.c. supply and is rated at 850 (standard) and 1,300 (heavy duty) watts. **Write or call: Phillips Manufacturing Co., Inc., 2816 Aldrich Avenue South, Minneapolis 8, Minn., for more information on Zero-Start engine preheater.**

OIL AND GAS JOURNAL

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- BULLETINS
- CATALOGS
- BROCHURES

Engine Case Histories. A new series covers a line ranging from 75 to 675 hp. The two-page case histories use pictures and drawings to illustrate applications using V-8 and V-12 engines of 540 to 4,000-cu.-in. size. Applications described in the first four histories include those of air conditioning and gas boosting. **For more information write or call: Le Roi Division, Milwaukee 1, Wis.**

●

Prelude to Tomorrow's Automation, a new 12-page, 2-color booklet, contains information on process instruments. The new folder highlights primary elements for detecting changes in temperature, pH, gas concentrations, and other operating variables. It also covers the line of Speedomax loggers, scanners, various process-gas analyzers, and complete process-control systems. **For more information write or call: Leeds & Northrup Co., 4907 Stenton Avenue, Philadelphia 44, Pa.**

●

Control Valves. A new bulletin describes a line of Series LB control valves. Bulletin LB-2, an illustrated 12-page booklet, details construction and operating characteristics of these valves offered in sizes 1 through 4 in. The bulletin includes specifications, photographs, engineering drawings, and valve-sizing data. **For more information write or call: Conoflow Corp., 2100 Arch Street, Philadelphia 3, Pa.**

●

A Positive System to Assure Accuracy of Long-Wave Ultraviolet Analysis is a brochure on the establishment of a system to assure accuracy of long-wave ultraviolet analysis, to prevent misinterpretation of fluorescent show in cores and cuttings. Drilling fluids that have fluorescent properties make black-light analysis of cores and cuttings incorrect and misleading. Comparison of the fluorescent properties of various crude and refined oils is shown versus the use of a nonfluorescent oil for emulsion drilling muds. Also included is a comparison in color photography of the difference between thread lubricants having both fluorescent and nonfluorescent properties. An actual copy of the study is included for perusal. **Write or call: Oil Base, Inc., 130 Oris Street, Compton, Calif., for No-Glo bulletin.**

●

Prefabricated Piping Catalog. A new 28-page catalog describes prefabricated insulated-piping systems for underground and overhead installations. The catalog includes systems for steam, condensate, hot or chilled water, and other fluids. It gives information on the design, applications, and installation of these systems. Technical data includes flow tables, pressure-drop curves, capacities, piping-system data, and suggested piping specifications. **For more information write or call: E. B. Kaiser Co., Glenview, Ill.**

●

Paxman Engines for the World's Oil Fields. Presenting drilling engines, this 4-color, 20-page brochure sets forth details on speed, power, installation, weight, interchangeability, spares, and service. It summarizes technical data in 2-color tables and includes exploded views, photographs, and engineering drawings. The brochure covers seven engines with ratings at 1,200 r.p.m. of 128 to 800 hp. **Write or call: Davey, Paxman & Co., Ltd., Colchester, England, for Publication No. 1478.**

●

Magnaflux-Magnaglo Magnetic-Particle Inspection. This 16-page, 2-color booklet deals with nondestructive testing in machinery manufacture and as a maintenance tool. It relates how the test machines work, the different sizes, and common uses. The booklet pictures such uses as checking for cracks in hand tools, pipelines, pressure vessels, drill pipe, and welding. **Write or call: Magnaflux Corp., 7300 West Lawrence Avenue, Chicago 31, Ill., for Form 151-8-56-SA.**

●

Reciprocating Pumps, 25 to 2,400 Hp., a four-page, two-color leaflet, features triplex (3-plunger), quintuplex (5-plunger), septuplex (7-plunger), and nonuplex (9-plunger) reciprocating direct-flow pumps. This condensed catalog presents dimension tables and a pump-selection chart. It is designed as a quick-reference source for engineers, production, and management personnel. It includes design and material specifications for these pumps which are used for water flood, salt-water-disposal service, and pipeline pumping. **Write or call: The Aldrich Pump Co., 30 Pine Street, Allentown, Pa., for more information on Data Sheet 100.**

Fluor Research. This new 12-page, 2-color bulletin describes the Fluor research facilities which are now available to industry on a contract basis for the first time in the firm's 66-year history. Services offered by this experienced outside research staff are explained, accompanied by case histories of recent research and development projects. **Write or call: The Fluor Corp., Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, Calif., for Fluor Research bulletin.**

●

Lincoln Linc-Weld Motors, a four-page folder, illustrates and describes a new line of electric motors. The two-color folder is punched for loose-leaf insertion. The motors feature a lifetime seal against chemicals, moisture, mechanical shorts, vibration, and dirt, and will operate in many places usually requiring splashproof or totally enclosed motors. The folder includes a cross-section, an exploded photograph, and a specification table. **Write or call: The Lincoln Electric Co., Cleveland 17, Ohio, for Linc-Weld Motors folder.**

●

Control of Moisture in Natural-Gas Streams. This technical-data sheet offers information on a method of continuously monitoring and controlling moisture in gas streams in natural-gas plants. An electrolytic hygrometer provides an alarm, or it automatically switches gas streams from a nearly saturated drying tower to a regenerated one. It also provides a permanent record of the outlet stream humidity. **Write or call: Beckman Instruments, Inc., Scientific Instrument Division, Fullerton, Calif., for Data Sheet EH-67-O(T).**

●

Power Points Digest, a 12-page, 2-color publication, explains the application of electric plants as a source of emergency electric power for communications. How various telephone companies, fire departments, and radio stations rely on emergency electric power in the event of highline-power interruption is described. **Write or call: D. W. Onan & Sons, Inc., Minneapolis 14, Minn., for Power Points Digest, Vol. 12, No. 1.**

●

Cathodic Protection Services and Materials are covered in a 12-page booklet. These services include protection of well casing and pipelines. The booklet discusses anodes, rectifiers, instruments, and methods used in oil-field cathodic protection. **Write or call: Corrosion Services, Inc., P. O. Box 7343, Tulsa, Okla., for cathodic protection services and materials booklet.**

EQUIPMENT MEN . . . in the News

Franklin Supply Elects Executive Vice President

LARRY HARPER

Larry Harper, vice president of Franklin Supply Co., has been elected executive vice president of the company. The announcement was made by Jene Harper, Franklin president, following the annual meeting of the company's board of directors.

In his new position, Harper will supervise the operation of Franklin's 22 stores and offices in the United States and Canada.

Harper, who has been vice president in charge of the southwestern and Mid-Continent area since 1949, joined Franklin as a warehouseman in 1939 at the Mount Pleasant, Mich., store. He has served as Illinois district manager, district manager at Mount Pleasant, sales representative in the Great Lakes region, and established the divisional office at Tulsa.

New Offshore Drill Barge Christened at Avondale

A new offshore self-contained floating drilling barge, the Delta Offshore Drilling Co. Inc., Elevated Deck Drill Barge No. 1, was recently completed by Avondale Marine Ways, Inc.

Participating in christening ceremonies were Mrs. Sam Israel, Jr., wife of Sam Israel, director of Delta; Alvin H. Howard, vice president and chairman of the board of directors of Delta; D. E. Vasser, president of Delta; H. Z. Carter, executive vice president of Avondale; and H. A. Broughton, the drilling superintendent who will be in charge of the new barge.

The Delta Offshore No. 1 is 156 ft. long, has a molded beam of 90 ft., a hull depth of 11 ft., and a height to the bottom of the superstructure of 40 ft. The barge is capable of handling six wells from one location. Maximum drilling depth is 20,000 ft.

Oilwell Names Kappel to Refinery-Pipeline Sales

The appointment of Henry V. Kappel as area manager, refinery and pipeline sales, for U. S. Steel Corp.'s Oil Well Supply Division at Tulsa has been announced by Mark Barkhurst, Mid-Continent area manager of the division.

Kappel joined Oilwell in 1947 as district engineer, refinery and pipeline-equipment sales, the position he held prior to his present appointment.

GE Appoints New Orleans Communication Engineer

J. W. Wiggins has been appointed district communication engineer for General Electric Co. in the New Orleans area. The appointment was dis-

REGARDLESS OF DEPTH
Larkin gets you there safely
Larkin Geyser Float Shoe Fig. 322
Larkin Regular Float Shoe Fig. 302
Larkin Male and Female Float Collar Fig. 401 M & F
Larkin Flapper Type Float Collar Fig. 404 M & F
Larkin Flapper Type Float Shoe Fig. 304
Larkin Regular Concrete Guide Shoe Fig. 202

closed by M. F. Chapin, New Orleans sales manager for General Electric mobile radio and microwave products.

Wiggins previously was an electronics maintenance technician for Civil Aeronautics Administration and spent 2 years in commercial electronics field engineering in Japan.

Chrysler Advances Yost, Lapp in West Coast Office

M. J. YOST

M. J. Yost has been named regional manager of the West Coast regional office of the marine and industrial-engine division of Chrysler Corp. J. J. Lapp has been named Los Angeles representative. These appointments were announced by C. C. Williams, vice president of sales.

Prior to his transfer to Los Angeles, Yost was sales representative for Chrysler with headquarters at Seattle, Wash., and before that was sales and service representative operating out of Detroit. He has been with Chrysler 29 years.

Lapp previously served as engineer and field-service representative for Federal motor trucks.

Kimray Completes Office-Plant Expansion

Kimray, Inc., Oklahoma City, has recently completed an expansion program which has more than doubled its machining and assembly facilities. In addition to the assembly section, the new building contains an electronics laboratory, drafting room, increased office space, and garage. This latest expansion is Kimray's fourth since 1950.

Kimray is headed by Garman O. Kimmell, president. The company, which manufactures oil-field controls, valves, and specialties, was organized in 1948.

Dresser Names Bradigan As Sales Representative

The appointment of Jack Bradigan as sales representative in sections of New York, Pennsylvania, and Ohio with headquarters in Bradford, Pa., has been announced by Dresser Manufacturing Division.

For the past several years, Bradigan has been associated with the customer-service branch of Dresser's sales department at the home office in Bradford.

Propellex Chemical Corp. Organized by Cooley

Dr. Robert A. Cooley, formerly with Olin Mathieson Chemical Corp., has announced the incorporation of a new company, Propellex Chemical Corp. in Edwardsville, Ill.

The new firm will engage in research,

Look back over the years at the thousands of cement strings that have been safely landed and cemented with Larkin Floating and Guiding Equipment.

The reputation that Larkin Equipment has earned for efficiency during this critical operation is the result of creative design and research . . . exacting manufacture.

The oil industry has learned to trust Larkin Equipment with its routine and tough jobs alike . . . because experience has proved that Larkin Floating and Guiding Equipment is uniformly strong, safe and efficient. Specify Larkin at your supply store, regardless of depth to get you there safely.

LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS

LARKIN
...Through Your Supply Store

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

development, and manufacture of propellants and explosives. Major emphasis for the petroleum field will be placed on gas-generating devices such as oil-well perforators, cement extruders, bridging plugs, and nonelectric-powered safety devices.

Blackmer Pump Elects Two New Vice Presidents

E. H. LANTHORN

The election of Elmer H. Lanthorn and Virgil A. Brunson as vice presidents has been announced by Britton L. Gordon, president of Blackmer Pump Co., following the annual meeting of the board of directors. Lanthorn has been elected vice president and director of sales. He joined the company in 1952 as general sales manager.

Brunson is vice president and chief engineer. He has been with the company for 20 years, and has served as project engineer, development engineer, and chief engineer.

Other officers reelected are: John B. Caldwell, vice president and director of manufacturing; Wilford D. Sawyer, treasurer and controller; Carl J. Riddering, secretary; Herman Venema, assistant treasurer; and Katherine H. McNamara, assistant secretary.

Miller, Granger Appointed By Leschen Wire Rope

William R. Miller and John H. Granger have been appointed sales representatives for Leschen wire rope division, H. K. Porter Co., Inc.

Miller's territory includes all of Arkansas, western Tennessee, northern Louisiana, and most of Mississippi. He was formerly with D-A Lubricant Co. Granger will cover all of New Jersey and Staten Island, N. Y.

Walworth Names Reid As Executive Assistant

Howard A. Reid has been appointed executive assistant to the vice president in charge of sales for Walworth Co., according to Fred W. Belz, president. Reid will coordinate advertising, market research, sales training, sales promotion, and public relations for Walworth. He formerly directed advertising and sales promotion for American Machine & Foundry Co.

National Supply Appoints Eastern Sales Manager

D. T. DENNEY

Donald T. Denney has been appointed division sales manager for the eastern division of The National Supply Co. He succeeds James C. Woods, recently named manager of the company's new export office at Houston. Denney joined National Supply in 1944 as a specialist in the sale of oil-field water-flood equipment. He was named a division sales representative in 1954, working from the eastern division offices at Toledo, Ohio. He will continue to have his headquarters at Toledo.

Birdwell's New Seminole Station Managed by Honea

Birdwell Surveys has established a new station in Seminole, Okla., it has been announced by James M. Bird, company president. The firm has been operating in Oklahoma for 3 years from headquarters in Tulsa. Birdwell now has 10 stations in 5 states, including

the home station in Bradford, Pa.

Cecil O. Honea, station manager in Seminole, has been transferred from Tulsa and is assisted by Homer E. Taylor. Both men have several years' experience in oil-well service work.

Bucyrus-Erie to Build Drill Plant at Richmond

A new 12-million-dollar drill-manufacturing plant will be built near Richmond, Ind., by Bucyrus-Erie Co., South Milwaukee, Wis. The new plant, which will be erected on a 148-acre site, will provide 300,000 sq. ft. of floor space.

Construction will begin as soon as possible, with completion scheduled for late 1957. Drills are now manufactured at the South Milwaukee and Evansville, Ind., plants. The space vacated at these two plants will be used to expand production of excavating machinery.

Welex Names Bentley As Sales Engineer

James C. Bentley has been named sales engineer at Pauls Valley, Okla., for Welex Jet Services, Inc. Bentley has been connected with oil-field-service work for 6 years, the past 18 months of which have been with Welex.

CSI Adds Humble to Engineering Staff

A. H. HUMBLE

A. H. Humble has joined the engineering staff of Corrosion Services, Inc., Tulsa, according to Yale W. Titterington, CSI general manager. Humble will design and install cathodic protection systems for pipelines, oil-well casing, and other buried structures.

Humble was formerly in the corrosion department of Gulf Refining Co. in Tulsa. He had been with Gulf since 1947, working with corrosion problems on storage tanks, pumping stations, and pipelines.

Johnson Heads Franklin's Branch at Estevan, Sask.

Franklin Pipe & Supply, Ltd., has opened an additional Canadian branch in Estevan, Sask.

Hal Johnson, formerly a salesman at the Edmonton store, has been transferred to Estevan as branch manager. Store men are George Pletschet, also from the Edmonton store, and Bud Walters, transferred from the pipe department of Franklin Supply Co.'s Chicago office.

In addition to the two stores, a sales office is maintained at Calgary.

Wolverine Agents Open Denver Service Facilities

New offices and mill-depot facilities have been opened in Denver to serve the customers of Wolverine Tube, division of Calumet & Hecla, Inc. The facilities will be operated by W. G. Cline & Co., western agent for Wolverine Tube. Copper water tube, refrigeration tube, and automotive tube will be stocked.

Axelson Appoints Witzel And Nave to Sales Posts

The appointment of D. L. Witzel as California sales manager has been announced by K. S. Ramey, sales manager of petroleum equipment, Axelson Manufacturing Co. L. T. Nave has been named special representative in the California division.

Witzel has been with Axelson since 1935 and has held several executive positions including assistant California

Otis standard "S" tools provide the most economical method yet of completing dual wells. Nipples are full-opening, permit use of through-tubing perforators, permit permanent completion squeeze jobs, acidizing, formation-fracturing, sand removal, etc. Ask your nearest Otis office for complete details.

16 Different Dual-Completion Tools — All Standardized on Otis "Type S" Dimensions

Are Used for These Otis Sub-Surface Controls	*These Standard "S" Assemblies*													
	Locking Assembly	Locator Assembly	Equalizing Valve	Conc. X-O Assembly	Bean Cage	Sub	Ring Check Assembly	Combination Adapter	Pack. Man. Sub-Assy.	Side Port Adapter	Sep. Tool Eq. Valve	Spacer Sub	Side Port Comb. Adpt.
1 Cross-Over Choke	S	S	S	S	S								
2 Regular Flow Choke	S	S	S		S			S	S				
3 Dual Side-Door Choke	S	S	S		S			S	S				
4 Dual Separation Tool	S	S						S	S	S	S		
5 By-Pass Side-Door Choke	S	S	S		S				S				
6 By-Pass Separation Tool	S	S							S		S	S	
7 Side-Door Choke	S	S	S		S				S				
8 Separation Tool	S	S							S	S	S		
9 Lower Zone Acidizing Tool	S	S	S		S			S	S				S
10 Upper Zone Acidizing Tool	S	S						S	S	S	S		S
11 Circulating Tool	S	S	S					S	S		S		S
12 Side Port Nipple Choke	S	S	S		S	S			S				
13 S-P Nip. Separation Tool	S	S				S			S	S	S		
14 Plug Choke	S	S									S		
15 Lower Zone } Ring Check	S	S	S		S		S		S				S
16 Upper Zone } Acidizing Tool	S	S					S		S	S	S		S

Otis — "First in Pressure Control"

OTIS PRESSURE CONTROL, INC.

Branches Throughout the Oil Country

sales manager. Nave, who joined Axelson in 1936, will continue his representation in Los Angeles, in addition to assisting the sales manager on export sales.

Bethlehem Promotes Allen, Transfers C. W. Young

The Panhandle-western district office of Bethlehem Supply Co. has moved into new quarters in the Petroleum Building, Amarillo, Tex.

J. T. Allen, formerly assistant store manager at Kermit, Tex., has been promoted to store manager and field representative at that point. C. W. Young, special representative for the Kansas district, has moved his headquarters from Russell to Great Bend.

Lunkenheimer Names Green As Sales Representative

Jack L. Green has been appointed Houston sales representative by Lunkenheimer Co. of Cincinnati, Ohio. He succeeds Joseph A. Birkhead, deceased.

Green previously covered the Rocky Mountain and southwestern petroleum, power and other industries for Republic Supply Co. and Western Oil Tool & Manufacturing Co.

SEALED TYPE "I" BOWEN JAR SAFETY JOINTS

BOWEN PRESENTS

SEALED LUBRICATION

for Less Wear
Reduced Servicing
Constant Tripping Tonnage

SEALED TYPE "I" BOWEN JAR SAFETY JOINTS are filled with oil and sealed top and bottom. The Sealed construction enables the tool to transmit circulating fluid at any pressure and prevents any contact between the well fluid and the working parts of the tool. With this arrangement, the moving parts work in a bath of oil.

SEALED TYPE "I" BOWEN JAR SAFETY JOINTS are compact combination units designed to provide the services of both rotary jars and safety joints. They are installed as safety devices in strings during testing, coring, reaming, drilling, sidetracking and washing over operations and are also used during fishing operations. At the will of the operator they will either deliver heavy upward or downward blows against a stuck string or fish — or they can be disengaged to salvage all the string that is above them. Besides sealed lubrication they feature:

ADJUSTABILITY IN THE HOLE *You can increase the tripping tonnage without coming out of the hole.*

FULL OPENING *Oversize circulation hole permits use of wire line tools and allows passage of large volumes of fluid.*

OUTSTANDING ADVANTAGES AS A JAR

The tripping mechanism in the SEALED TYPE "I" BOWEN JAR SAFETY JOINTS is a straight pull mechanical type.

Torque free operation eliminates any aggravating tendency to release fishing tools, reduces equipment wear, and avoids hazards.

Because the tripping mechanism is purely mechanical, heavy blows can be struck despite packing failures or high temperatures and the same heavy blows will be delivered regardless of whether the string is elevated slowly or rapidly.

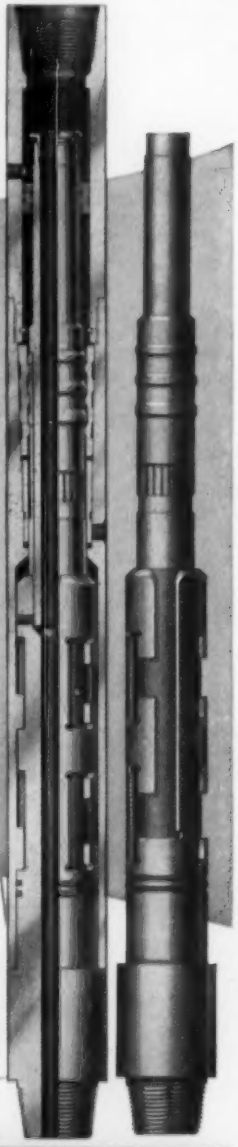
The tripping pull can be increased while the tool is in the hole or the tripping pull can be either increased or decreased while the complete tool or just the Bowl Assembly is at the surface. After considerable use, the wearing parts in SEALED TYPE "I" BOWEN JAR SAFETY JOINTS can be replaced easily and economically and the tool will regain all the properties of a new one.

OUTSTANDING ADVANTAGES AS A SAFETY JOINT

SEALED TYPE "I" BOWEN JAR SAFETY JOINTS will deliver the full torque capacity of the string in either direction.

At the will of the operator, the Bowl Assembly can be separated from the Main Mandrel Assembly of the tool to salvage all of the string that is above it.

Later the Bowl Assembly can be reengaged with the Main Mandrel Assembly in the hole for subsequent recovery operations.



Write for descriptive literature.

SR BOWEN CO

MAIN OFFICE AND PLANT:
11809 SOUTH NORWALK BOULEVARD
SANTA FE SPRINGS, CALIFORNIA
EXPORT OFFICE:
30 ROCKEFELLER PLAZA
NEW YORK CITY, NEW YORK

Warner Lewis Appoints Midwest Zone Manager

Warner Lewis, Jr., has been appointed Midwest zone manager for Warner Lewis Co., a division of Fram Corp. He will be in charge of the new Midwest zone office in Chicago. Prior to his new appointment, Lewis served as assistant manager in charge of sales in the western United States.

The new Midwest zone office in Chicago will supervise activities of company representatives in Illinois, Ohio, Indiana, Wisconsin, Michigan, and eastern Missouri.

The Warner Lewis plant and home office is in Tulsa.

Delta Names Two to Oil Field Equipment Division

Appointment of John W. Young and W. R. Roberts as sales engineers for Delta Tank Manufacturing Co., Inc.'s oil-field equipment division has been announced by Ross B. Baze, vice president. Young has been assigned to Delta Tank's Westwego, La., staff. Roberts is with the Lafayette, La., staff.

Young previously served as a mud engineer with National Lead Co.'s Baroid division in Texas, Oklahoma, and Canada. Roberts previously served with other equipment fabricators in Lafayette and New Orleans.

Delta, a wholly owned subsidiary of General Gas Corp., operates plants in Baton Rouge, La.; Macon, Ga.; and Beardstown, Ill.

Wagner-Morehouse Elects Officers and Directors

Election of the following new officers and directors of Wagner-Morehouse, Inc., of Los Angeles, has been announced by Harry C. Morehouse, president, succeeding Charles D. Wagner, recently retired:

Harry C. Morehouse, president; Robert P. Gaylord, vice president; John C. McClure, secretary-treasurer.

Prior to his association with Wagner-Morehouse, Inc., Morehouse spent 35 years in the manufacturing division of the industry, associated with National Supply Co. He was an officer and a director of Emsco Derrick & Equip-

EVERY FIELD

OF ENDEAVOR

HAS PRODUCED

ONE

TOP PERFORMER

The greatest

race horse

of all time—

Man O' War

EVERY FIELD OF ENDEAVOR

HAS PRODUCED ONE TOP PERFORMER

In horse-racing it was Man O' War.
For smooth, free plunger operation under all kinds of pumping conditions it is

oilmaster

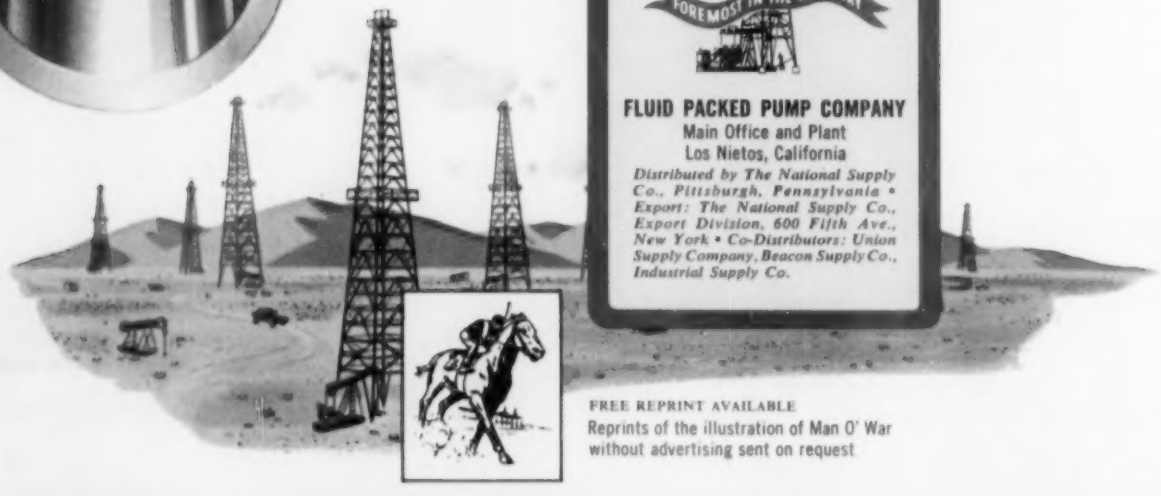
HARDENED AND HONED ONE PIECE PUMP BARRELS

Their design and general construction can, has and will be copied, but THIRTY YEARS OF EXPERIENCE and KNOW-HOW in this field of endeavor are the exclusive property of FLUID PACKED PUMP COMPANY.

oilmaster PUMPS
FOREMOST IN THE INDUSTRY

FLUID PACKED PUMP COMPANY
Main Office and Plant
Los Nietos, California

Distributed by The National Supply Co., Pittsburgh, Pennsylvania • Export: The National Supply Co., Export Division, 600 Fifth Ave., New York • Co-Distributors: Union Supply Company, Beacon Supply Co., Industrial Supply Co.



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Reprints of the illustration of Man O' War without advertising sent on request

ment Co. prior to joining Wagner in 1936.

Gaylord for the past 12 years has served as assistant to the vice president of the company. Previous to that time he was with Goodyear Tire & Rubber Co.

McClure was formerly sales manager for Wagner-Morehouse, covering the company's entire domestic and foreign markets. He was with Kobe, Inc., prior to joining Wagner-Morehouse.

Nordberg Names Metcalf As Electrical Engineer

A. T. METCALF

Appointment of Albert T. Metcalf as electrical engineer at Nordberg Manufacturing Co., Milwaukee, Wis., is announced by Robert E. Friend, president. In this position he will assist all product engineering, manufacturing and sales departments and will maintain liaison with electrical-equipment manufacturers.

Prior to joining Nordberg, Metcalf spent 6 years with Anglo-Lautaro Nitrate Corp., Chile, as electrical engineer. He also served 6 years in electrical-maintenance work at Bethlehem Steel Co.

P-W Industries Appoints Chemical-Petroleum Agents

P-W Industries, Inc., has recently appointed the following representatives for its chemical and petroleum division: The Ben McKalip Co., Tulsa; The Ben Fogelman Co., Pittsburgh, Pa.; J. R. Simpson Co., Maywood, Ill.; and James S. Kone & Co., Armarillo, Tex.

Jones & Laughlin Occupies New Plant

Jones & Laughlin Supply Division is taking occupancy of the firm's new $1,700,000 headquarters building in Tulsa's new Siegfried Sites industrial area. A formal dedication program will be held on December 5 when Admiral Ben Moreell, chairman of the board of Jones & Laughlin Steel Corp., and other executives of the parent firm in Pittsburgh, meet in Tulsa to officially open the new plant.

Participants in the ceremony also will include John E. Timberlake, Pittsburgh, Jones & Laughlin's vice president of sales, Rainey Elliott, president of the Supply Division, and other Supply Division officials.

The new Supply Division building contains more than 100,000 sq. ft. of space. It consists of office space and a large warehouse.

Crescent Oil Well Supply Opens Permanent Quarters

A. Rex Watkinson, Jr., president and general manager of the recently formed Crescent Oil Well Supply Co., has announced the opening of the permanent offices in the Oil Capital Building, Tulsa. Previously, the company was temporarily located in the Atlas Building.

Cook Testing Appoints Three Vice Presidents

The appointment of John Dickman, Hi Whitney, and A. W. Smith as vice presidents has been announced by R. M. (Bob) Cook, president of Cook Testing Co., Long Beach, Calif. Dickman is chief engineer, Whitney, sales manager, and A. W. Smith is in charge of West Texas and New Mexico for the company.

Charles Shiro has been appointed export representative for the company with offices in New York City.

Birdwell Surveys Names Powell Sales Manager

W. E. POWELL

Wilbur E. Powell has been appointed sales manager for Birdwell Surveys, Bradford, Pa., according to James M. Bird, company president. He will be in charge of a sales staff of seven in the oil and gas fields of Oklahoma, Illinois, Ohio, Kentucky, West Virginia, and Pennsylvania.

Powell, formerly sales manager in Illinois for Larkin of Butler, has returned to Birdwell after an absence of 6 years. He will also be in charge of advertising for Birdwell.

Birdwell Surveys, an oil and gas well servicing organization, now operates from 10 stations in five states, including the home station in Bradford.

Weston Opens Four District Sales Offices

To provide more comprehensive sales and application-engineering service to instrument users, Weston Electrical Instrument Corp., Newark, N. J., has opened district sales offices at Los Angeles; Cincinnati, Ohio; Philadelphia, Pa.; and Union, N. J. (shown above). Weston, a leading manufacturer of instruments for electrical measurement and for automatic control, is a subsidiary of Daystrom, Inc.

Mid-Western Unveils New Earth Moving Equipment

Two hundred industrial editors and Mid-Western Industries, Inc., distributors participated for 2 days, at Wichita, Kans., in an unveiling of new Davis earth-moving and material-han-

dling equipment. Representatives of 15 industrial magazines and 100 distributors from every state in the nation attended the 2-day sales conference.

Davis products and new wrinkles in the old, were featured. Receiving wide attention were the new Davis 210 back-hoe, the 185 back-hoe, the truck-mounted back-hoe for either model, and the leaders.

Keynote speaker both days was E. W. Davis, newly appointed general sales manager for Mid-Western Industries, who reviewed company progress and outlined the market potential for the products.

Kaiser Appoints Fekula As Chief Process Engineer

Dr. George M. Fekula has been appointed chief process engineer of the refinery division, Kaiser Engineers Division of Henry J. Kaiser Co. Fekula will supervise process engineering of refineries and petrochemical plants.

Fekula was formerly technical consultant on petroleum projects for National Petroleum Council in Brazil and cooperated in the organization of a new graduate school for the training and development of petroleum-refining engineers and technical management for the expanding Brazilian petroleum industry. Previous to his work in Brazil, Fekula was process-design engineer for California Research Corp.

Dresser Reorganizes Top Management Staff

Hector P. Boncher will be in charge of Dresser Industries, Inc.'s heavy-machinery divisions, supervising the operations of Clark Brothers, Dresser Manufacturing Division, Roots-Connersville Blower Division, Pacific Pumps, Inc., and Dresser-Ideco Co.

H. P. BONCHER

HENRY HERZIG

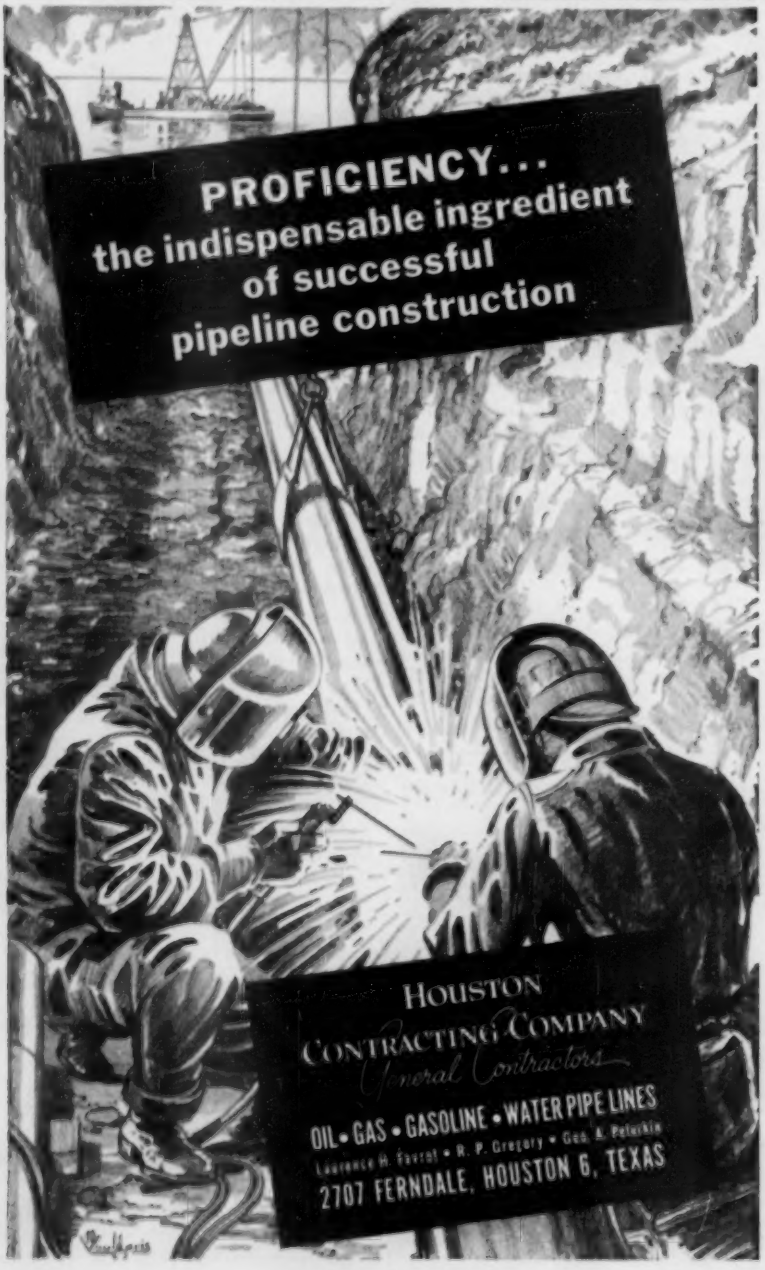
Henry Herzig is appointed operating vice president in charge of Lane-Wells Co., Well Surveys, Inc., Ideco, and Security Rock Bits, Ltd., in England. Otto Hammer becomes operating vice president of Dresser Industries, Inc. He will be in charge of Guiberson Corp., recently acquired by Dresser, and Security Engineering Co. operations.

OTTO HAMMER

R. H. McLEMORE

Robert H. McLemore is appointed vice president and general manager of the new turbodrill division of Dresser Industries, Inc. These personnel changes were announced by J. B. O'Connor, president. All of these Dresser staff officials will headquarter in Dallas, Tex.

Before his recent appointment, Boncher was operating vice president of Dresser and prior to that was general manager of Dresser Manufacturing Division. Previously, Herzig was director of manufacturing for Dresser Industries. Hammer was formerly president of Security Engineering. Prior to his appointment as director of oil-well services for Dresser, McLemore was executive vice president and general manager of Welex Jet Services.



General Geophysical Ships Equipment To Venezuela

A mobile division from the Houston-based General Geophysical Co. departed from the Port of Houston recently and its initial assignment will be a reconnaissance of oil and gas possibilities in virgin sectors of Venezuela.

Loaded aboard the SS Stentor were

A drilling truck to be used in geophysical prospecting in South America is checked prior to being loaded aboard ship, by Chester Sappington, General board chairman; Howard Gilbert, chief observer; and T. O. Hall, president of General Geophysical Co.

nine vehicles of varying sizes and for various purposes. These were in addition to tons of drill pipe, spare parts and maintenance equipment.

Flying to Venezuela later to direct the big operation for Superior Oil Co. will be seven specialists from the Houston headquarters. These are William Penney, Werner Werli, Tommy Dushane, Marion Novakoski, W. Fontenot, Harold Mueller, and Jack Mueller.

In all, about 50 men will be used to turn up oil prospects but the balance will be natives of Venezuela. Included in the shipment were a recording truck, one shooting truck, two drill trucks, four water trucks, one oil-field body truck, and three wagon expresses.

Infilco Elects Two Vice Presidents

The election of E. G. Kominek and A. A. Kalinske as vice presidents of

E. G. KOMINEK

A. A. KALINSKE

the company has been announced by the board of directors of Infilco, Inc.

During his 19 years with Infilco, Kominek has been research chemist, head of the industrial-waste division, assistant sales manager and general sales manager, a position which he now holds.

Kalinske has been director of research and development for Infilco for the past 10 years. As director of research, he has developed many modern techniques in the handling and treatment of liquids.

Lane-Wells Announces Field Personnel Shifts

Lane-Wells Co. has announced the following location and personnel changes: Edward C. Butts, Jr., has been transferred from Houma, La., to Houston, Tex., as district sales engineer trainee.

Carl H. Leidecker has been shifted from Bakersfield, Calif., to Pampa, Tex., as district sales engineer.

Bryant Named Perrault Field Representative

Walter Bryant has joined Perrault Equipment Co., Tulsa pipeline-equipment manufacturer and distributor, as Southwest district field representative, according to W. O. Dixon, owner of Perrault.

Bryant will service pipeline contractors and oil and gas companies with the

TC

CUPRIC CHLORIDE

MADE FROM VIRGIN COPPER FROM OUR OWN MINES

PRODUCED BY THE
TENNESSEE CORPORATION
MINERS OF COPPER, ZINC, IRON AND SULPHUR

A SUPERIOR SWEETENING REAGENT IN PETROLEUM REFINING

We are in a position to supply your needs on annual, semi-annual or monthly contract basis—also smaller quantities in drop shipment lots.

CUPRIC CHLORIDE DI-HYDRATE

TYPICAL ANALYSIS

Copper	37.00% minimum
Moisture	12.00% maximum
Fe	.04% maximum
Zn	.01% maximum
Copper Oxychloride—less than	.50% maximum

CHECK THESE FEATURES

High Copper Content
Lower Moisture
Uniform Particle Size
Uniformity
Availability

For
1. Quality Improvement
2. Cost Reduction

Other Tennessee Corporation products:
Ferric Sulfate (Ferri-Floc),
Copper Sulfate
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Sulfur Dioxide.

For samples make request on your company letterhead.

TENNESSEE TC CORPORATION
617-619 Grant Building, Atlanta, Ga.

complete Perrault line of equipment and supplies. He previously served with Stanolind Exploration Co. and Arey Construction Co.

Rawson & Co. Names Moore As Sales Engineer

The appointment of Robert E. Moore as a sales engineer has been announced by Rawson & Co., Houston, Tex. Moore was with Shell Chemical Corp. at Houston for 7 years, serving in technological and operating departments.

Rawson & Co. operates in Texas and Louisiana and represents Petro-Chem Isoflow Furnaces, Stratco Contractors, and Flash Evaporators, Ducon Cyclones, Brodie Meters, United States Gauges, and other equipment for petrochemical industries.

Ball & Black Distributes Racebilt Pipe in California

Announcement of the appointment of Ball & Black Supply Co. of Los Angeles as distributor in California of Racebilt aluminum industrial pipe has been made by David F. Scales, vice president and sales manager of Race & Race, Inc., Winter Haven, Fla.

Ball & Black Co. will initially stock Racebilt aluminum pipe for oil-field use. The firm's new, lightweight, quick-coupling industrial pipe is used for oil, water, and gas lines in the petroleum fields.

Oilwell Boosts Love To Ass't. District Manager

J. T. LOVE

Promotion of James T. Love to assistant district manager, with headquarters in New Orleans, was announced recently by M. F. Jones, Gulf Coast area manager for U. S. Steel's Oil Well Supply Division. Love has served as district representative at New Orleans since April of this year. All of his 10 years' service prior to that time was at Beaumont, Tex. He joined Oilwell at Beaumont in 1946 as district engineer, refinery and pipeline equipment sales. In 1950 he became manager of the Beaumont store and in 1955 he again was named district engineer—refinery and pipeline sales, holding that post until his transfer to New Orelans.

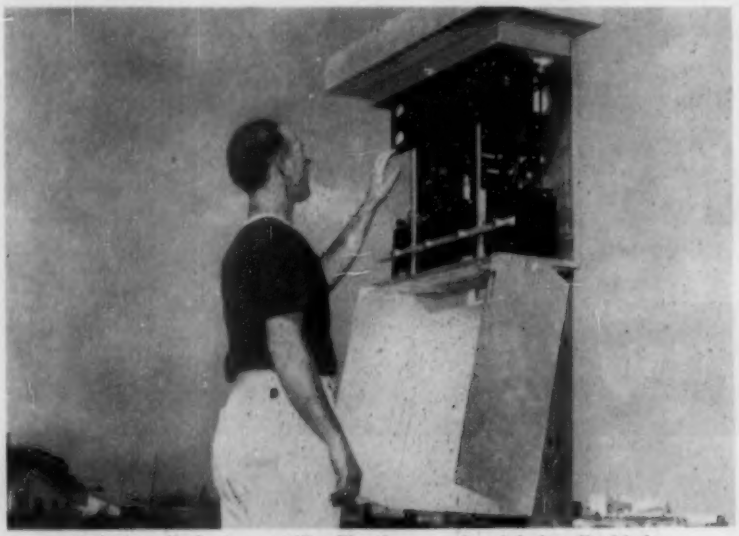
Maxim Appoints Manager Of Field Engineering

The appointment of Lee J. Doyle as manager of field engineering has been announced by Maxim Silencer Co. of Hartford, Conn., subsidiary of Emhart Manufacturing Co.

Doyle spent 10 years with Industrial Sound Control Corp. before joining Maxim. He will work with Maxim representatives in the field on problems of industrial silencing.

Beech Delivers Super 18 To An-Son Petroleum Corp.

Shown taking delivery on An-Son Petroleum Corp.'s new Beechcraft Super 18 is An-Son chief pilot John Ross. Wth Ross is Norman Blake, president of Aircraftsmen, Inc., Beechcraft distributor at Oklahoma City. The new plane is the sixth Beech airplane to serve An-Son Petroleum, an Oklahoma City firm.



CSI-designed selenium rectifier like those used on job described below.

MAJOR PIPELINE PROTECTED WITH RECTIFIERS AND ANODES

A major pipeline company needed cathodic protection on a line that runs through six states. It asked for competitive bids.

CSI was awarded the contract, and agreed to furnish all necessary labor, materials and installation equipment.

In only 32 days, CSI engineers completed the entire job. They installed 23 rectifiers complete with wire, graphite rods and coke breeze. They installed 120 magnesium anodes, and set up approximately 110 test points for the periodic measuring of line currents.

CSI has 20-foot power augers, ditching machines and trained personnel to help you with your installation problems. CSI also offers expert consultation service and brand-name cathodic protection materials—including Dow magnesium anodes.

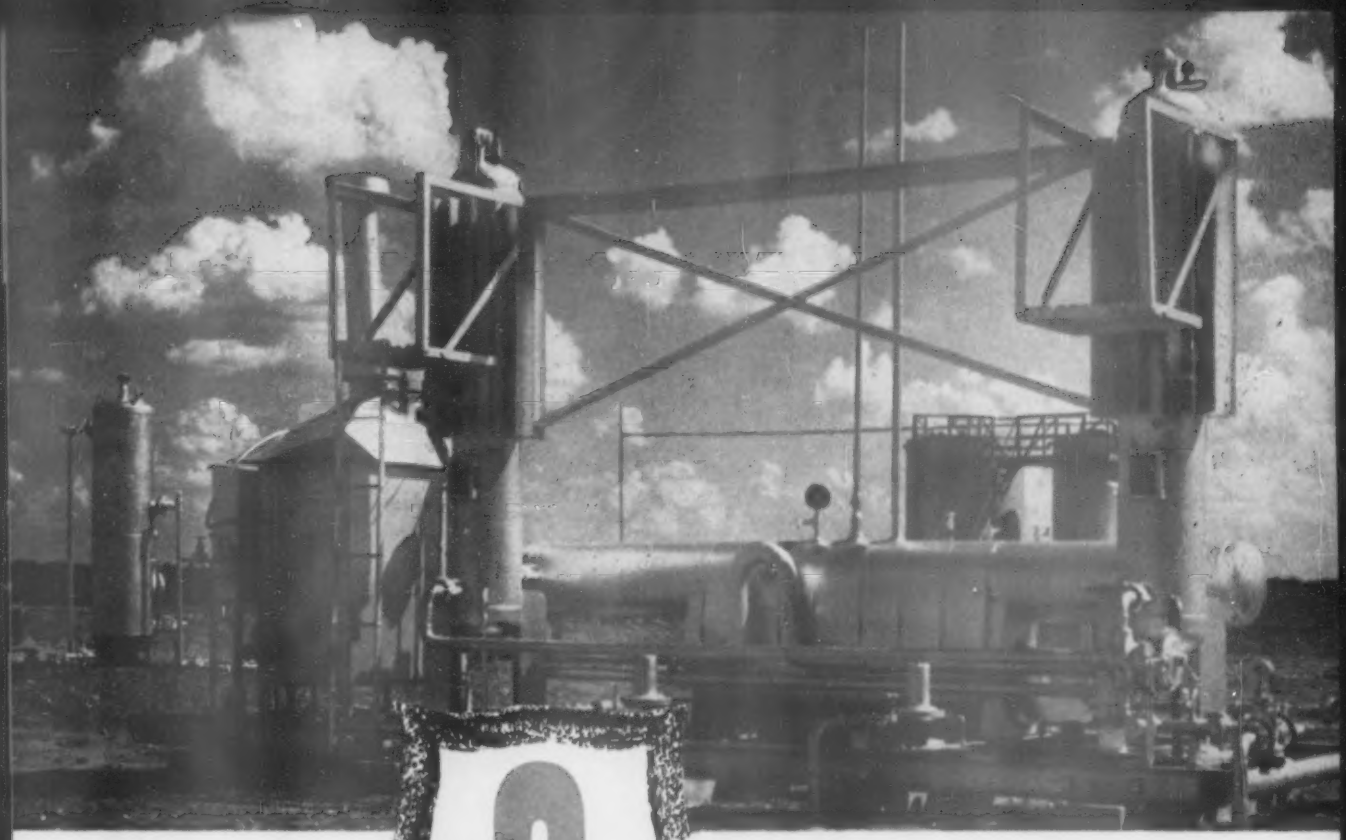
For estimates or quotations, call or write today.

CSI

CORROSION SERVICES INCORPORATED

Tulsa, Oklahoma

P. O. Box 7343, Dept. 29 Telephone: Circle 5-1351



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In addition to obtaining the most efficient dehydration in the world today, you realize tremendous savings with the Parkersburg DAU WELDRIER.

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Case History of 2 Wheland HP-18000 Pumps:
No. 1—Excellent performance on 112,000' of hole.
No. 2—Seven wells completed since March, 1956.

Here is the second Wheland HP-18000 Pump purchased by Bilbo-Redding, shown on location at Cleveland, Texas. Their first pump's record was so good, this one was put in service 11 months later.

PERFORMANCE SOLD THE SECOND PUMP

". . . exceptional performance . . . operated with ease at all pressures within their ranges . . . required little maintenance."

WHELAND HP-18000 DUPLEX SLUSH PUMP

7¾" x 18", 750 HP Nominal Input at 60 RPM.
Discharge Pressure with 7¾" liner, 1322 PSI;
with 5½" liner, 2700 PSI.

BULLETIN ON REQUEST

BILBO-REDDING DRILLING CO., INC.
POST OFFICE BOX 203
HOUSTON 1, TEXAS

October 26, 1956

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

The Wheland HP-18000 750 HP Pump we bought from you in May of 1955 went immediately into service in the Texas Gulf Coast and has given excellent performance on 112,000 feet of hole.

This pump's record was so good that we put a second one into service early in March of this year. We have already completed 7 wells in the Gulf Coast area using the second pump.

Both of these pumps have given exceptional performance, have operated with ease at all pressures within their ranges and have required little maintenance.

Sincerely yours,

BILBO-REDDING DRILLING CO., INC.

T. P. Bilbo

T. P. Bilbo, Vice-President

TPB:da

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THE WHELAND COMPANY

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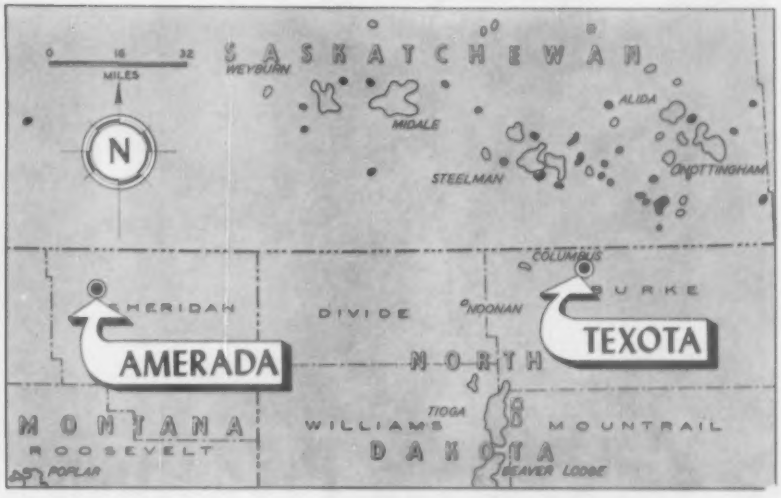
Williston Still Rates "Good Hunting"



TWO NEW STRIKES in the United States portion of the Williston basin should add to that province's attractions for the wildcatter. Saskatchewan's 1956 discoveries are in solid black.

by Frank J. Gardner

DRAMATIC things are happening in the Williston basin. And it's a fitting postlude to the recent basin symposium at Bismarck, N. D. For new discoveries on both sides of the forty-ninth parallel have emphasized the truth of the one basic conclusion that came out of that symposium: **the Williston basin is one of the best undeveloped sedimentary basins in North America in which to hunt for oil and gas.**

Flagged on the map are two new strikes on the United States side of the basin. Both are still in the testing and logging stage, but both have found sufficiently good showings to point to new fields.

A Silurian strike . . . In Sheridan County Montana, Amerada Petroleum Corp. is opening that county's first production at its 1 Tange, a remote wildcat 1½ miles south of Outlook townsite, in Section 20-36n-53e. On a 5-hour drill-stem test of the Silurian at 9,050-9,230 ft., the well flowed at an estimated rate of 20 bbl. of fluid hourly at the end of 2 hours; at first, this was 70 per cent oil, but at the end of the test was nearly 100 per cent oil. Amerada carried the hole to 9,950 ft., topping Silurian at 9,018 ft., Red River-Ordovician at 9,582 ft., and Winnipeg at 9,905 ft. Tests of the Winnipeg at 9,920-32 ft. showed only salt water, and the Red River at 9,812-50 ft. yielded water and only a trace of oil. At the moment, tests continue to be made of the Ordovician section, but a Silurian strike seems assured.

This new oiler is important not only because of its position in the center of huge blocks of sparsely drilled acres (nearest production is 29 miles away), but also because of the age of the reservoir. There is no production now from the Silurian in North Dakota, although the first oil ever to flow in the state did come from that formation; the nearest Montana field of Silurian age is Southwest Richey, 92 miles south-southwest of the new strike. To the north, the Silurian has not accounted for commercial Canadian oil, but geologists there have high hopes for it, and this discovery should encourage a Silurian search north of the border.

Rings the bell . . . Almost at the same time as the Amerada discovery at 1 Tange, North Dakota apparently rang the bell with a new discovery 100 miles to the east. In Burke County, Texota Oil Co. 1 Sorum (Section 23-163n-91w) reported recovery of 95 ft. of clean oil and 280 ft. of oily mud on a 4-hour test of the Mississippian at 5,841-66 ft. These operators at last report were logging and preparing to complete, after carrying the hole to 6,297 ft. This is Texota's sixth in a series of wildcats aimed at prospects east of the Nesson anticline, and it lies 25 miles northeast of the big Tioga field, and 13 miles east of the single small Madison producer at Columbus field (also a Texota 1956 strike).

These two new discoveries should serve a double purpose. The Amerada well should surely draw new attention to the possibilities of the pre-Mississippian rocks throughout the Williston basin; only recently a deep test 10 miles southeast of the 1 Tange stopped in Mississippian-Madison at 7,290 ft., a couple of thousand feet or so short of the Silurian. Amerada's deep-testing activities at Beaver Lodge, now under way, may shed further light on the pre-Mississippian section and its potentialities.

The Texota well, while it may prove to be a modest discovery, is just another testimonial to the rewards that await the persistent driller in the shallower parts of the basin.

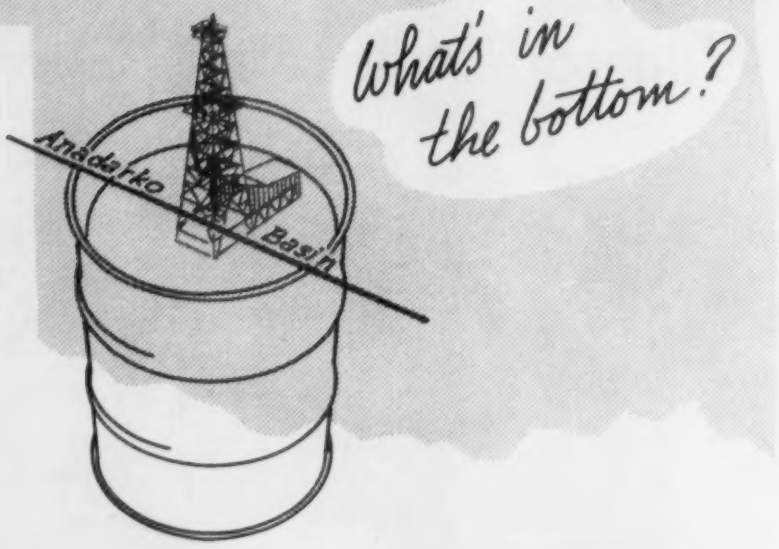
Both wells should lure more wildcat money into Williston. The geologists in the basin refuse to recognize the forty-ninth parallel as an effective barrier to the migration of oil, and the success spree now going on in southeastern Saskatchewan should spread southward in months to come.

On dry-hole discouragement . . . Some idea of the scope of the Canadian success can be gained from a study of the map. The solid, or black, fields have all been found this year; older fields are shown in outline only. Here, nearly a hundred rigs are whirling, as more than 30 geophysical parties busily sketch out new prospects for rigs yet to come. This is a most remarkable play, in view of the almost complete withdrawal of oil hunters from Saskatchewan in 1945; explorers then were discouraged by dry holes and a threat of socialization.

In North Dakota, the threat of socialization has never existed, but dry holes do. Will history repeat itself south of the border? Probably.

- Deep exploration
- Pre-Pennsylvanian producing prospects
- Drilling below 20,000 ft.
- Wide spacing
- Unitization for development

Geologists consider these factors as . . .



Anadarko Basin Yields Deep Production

by H. F. Suffield

THE completion of excellent producers from the Ordovician (Simpson sands) in Grady and Caddo counties has brought renewed interest in the producing prospects for the deeper portions of the Anadarko basin of western Oklahoma.

Oklahoma's deepest . . . In February 1956, British-American Oil Producing Co. completed its 2 Harrison in 29-3n-5w, located on the southwestern flank of Carter-Knox field of Grady County. The well reached a total depth of 15,310 ft. after setting 7-in. casing at 14,931 ft. Productive Second Bromide sand was logged from 14,910 to 15,040 ft. and the Third Bromide sand for Oklahoma's deepest producer. The well had a calculated open-flow potential of 175,000,000 cu. ft. of gas with 24,150 bbl. of condensate per day. (Based on 138 bbl. of condensate per M.M.c.f.)

Bottom-hole shut-in pressure reached 9,408 psi. Since completion the 2 Harrison has been marketing approximately 8,000,000 cu. ft. of gas and 1,000 bbl. of condensate per day, for an accumulated recovery to August 1 of 978,731,000 cu. ft. and 132,745 bbl. Based on a market price of $2.90 per barrel and 9.85 cents per 1,000 cubic feet, this production had a gross value of $481,725.51.

Author is consulting petroleum geologist, Oklahoma City.

New discovery . . . In September Sinclair Oil & Gas Co. completed the 1 Susie as a wildcat discovery in 1-6n-13w, Caddo County. The First and Second Bromide sands from 8,684 to 8,786 and 8,811 to 8,909 ft. were found to be oil bearing. A total depth of 9,622 ft. in the Oil Creek formation was reached. However, both this formation and the McLish sands lacked porosity and permeability so the well was plugged back and completed from perforations in the First and Second Bromide sands. Flowing through an 18/64-in. choke, the 1 Susie had a calculated potential of 710 bbl. of oil per day.

Drilling

Past . . . Since the completion of the first commercial producer in Cement field, Caddo County, in 1916, the basin's oldest field, imaginative oil men and exploration geologists have wondered as to the oil and gas-producing possibilities of deep formations near the axis of the Anadarko basin. Venturesome individuals and oil companies have attempted to satisfy their curiosities by drilling deep tests. (Deep in relation to common drilling depths at that particular date).

The depths reached were controlled, not so much by cost as by the limited capacity of drilling equipment and drilling materials. Those tests drilled below 15,000 ft. in western Oklahoma are listed in Table 1, with their locations spotted on the map of the Anadarko basin.

Present . . . Modern equipment, actually in use by several drilling contractors principally at Gulf Coast offshore and West Texas-New Mexico operations, is capable of reaching 20,000 ft. with 4½-in. and 25,000 ft. with 3½-in. drill pipes.

Advanced steel qualities have greatly reduced the occurrence of failures, for both drill pipe and casing, caused by fatigue, depth, and high temperatures and pressures.

Future . . . Increasing depth penetration is not the obstacle it was and has opened a whole new area for exploration—the deep portions of the Anadarko basin of Oklahoma.

Anadarko Basin

Scope . . . The extent of the Anadarko basin has been defined many times by well qualified geologists. It may be described as a mobile asymmetrical basin bordered on the south by the Wichita-Amarillo uplifts, on the east by

TEN WELLS have gone below 15,000 ft. in western Oklahoma to test the secrets of the deep portion of Anadarko basin (See Table 1).

the Nemaha ridge, to the north by the Central Kansas uplift and to the west by the Las Animas arch.

Actually, the Anadarko basin may be considered as a continuation of the Ardmore basin of southern Oklahoma that widens and deepens northwestward. Most of the sedimentary rocks in the basin are of Paleozoic age, ranging from Cambrian through Permian. The trough, or deepest portion of the basin, is located just north of the Wichita Mountains with an estimated depth to the pre-Cambrian basement of over 5 miles. The axis of the Anadarko basin (see map) extends from the western Arbuckle Mountains northwestward through Grady, Caddo, Washita, Custer and Roger Mills counties and on into the Texas Panhandle.

Development . . . Up to the present time, drilling has been mainly confined to exploration of the basin's border areas. Excellent oil and gas fields have resulted with hopes for many others.

TABLE 1—WELLS DRILLED BELOW 15,000 FT. IN WESTERN OKLAHOMA

Map designation	Year	Company, well, and location—	County	Total depth (ft.)	Formation
A	1947	Superior, 1 Weller, 11-8n-12w	Caddo	17,823	Springer
B	1948	Denver, 1 School Land, 16-10n-9w	Caddo	17,094	Simpson
C	1948	Stanolind, 1 Briscoe, 4-4n-5w	Grady	15,184	Arbuckle
D	1950	Sunray, 1 Hanan, 1-19n-24w	Ellis	15,047	Wilcox
E	1952	Phillips, 1 Flynn, 27-11n-23w	Beckham	15,121	Des Moines
F	1952	Little Nick, 4 Glover, 27-5n-8w	Grady	15,806	Penn. or Miss.*
G	1953	Shell, 1 Caughron, 19-10n-21w	Beckham	15,625	Atoka
H	1956	British-American, 2 Harrison, 29-3n-5w	Grady	15,310	Bromide
J	1956	Frankfort, 1 Pruitt, 16-4n-8w	Grady	18,158	Springer
K	1956	Frankfort, 1 Blackbear, 7-5n-10w	Caddo	16,962	Springer

For many years the east and southeastern portions of the basin have been exceedingly productive with extensive oil and gas-field developments associated with the Nemaha ridge and Pauls Valley-Lindsay arch. More recently, several discoveries have been made of oil, gas, and gas-condensate reservoirs in the northward converging Mississippian and Pennsylvanian rocks of northwestern Oklahoma.

Prolific oil and gas fields along the south flank of the Anadarko basin and extending into the adjoining Ardmore basin are the results of folding, faulting, and varying amounts of truncation and deposition accompanying the Wichita-Arbuckle orogenies or mountain uplifts.

Production in the basin has been encountered at depths ranging from a few hundred feet to below 15,000 ft. and in rocks of all geological ages from Cambrian to Permian.

Basin trough . . . North of the Wichita Mountains, the subsurface formations dip steeply into the trough of the basin. Those fields nearest the mountain front are of relatively shallow depths. The Apache pool is the most prolific having encountered Ordovician (Simpson sands) production at an average depth of 3,500 ft. The Northwest Apache pool (recently discovered at the Sinclair 1 Susie) is 8 miles to the northwest proving Simpson (Bromide) sand production at 8,800 ft.

Farther to the northeast and approaching the axis of the basin are the faulted and truncated anticlines of Carter-Knox, Chickasha, and Cement. To the west Elk City field is oil and gas productive from an elongated anticline generally paralleling the Wichita Mountains.

Deeper Prospects

Producing fields . . . The discovery of prolific Ordovician (Bromide sands) production by British-American's 2 Harrison under the Carter-Knox field (near the junction of the Anadarko-Ardmore basins) followed by the Sinclair 1 Susie discovery in Caddo County are indicative of the deeper possibilities for the producing fields of the basin area.

Cement and Chickasha fields are oil and gas productive from a number of formations of Permian and Pennsylvanian age. The deepest test drilled on or near these prominent structures only reached the Springer series of the Lower Pennsylvanian. Magnolia recently spudded at the 1 Sterba, 35-6n-10w, as an Ordovician test on the west dome of Cement field.

Elk City field is productive from arkosic sand conglomerates at varying

intervals from 8,800 to 10,300 ft. in the Missourian (Hoxbar) of Pennsylvanian age. The deepest test drilled on this structure reached a total depth of 15,625 ft. The oldest beds penetrated to date have been the Caney shales of Mississippian age.

The potentialities of oil and/or gas production from the deeper formations under such prominent features as the Cement, Chickasha and Elk City anticlinal structures are tremendous.

Of particular significance are the thick sands of the Simpson group of Ordovician age because they have furnished reservoirs for excellent production in many areas of the Anadarko basin. Also of importance are the prospects of Devonian (Hunton limestone) and perhaps Mississippian (Chester and Sycamore) production.

Other areas . . . The prospects for deep production are by no means confined to the present production fields of the Anadarko basin of western Oklahoma. Outlined on the map are several prospective areas for deeper exploration near the trough of the basin.

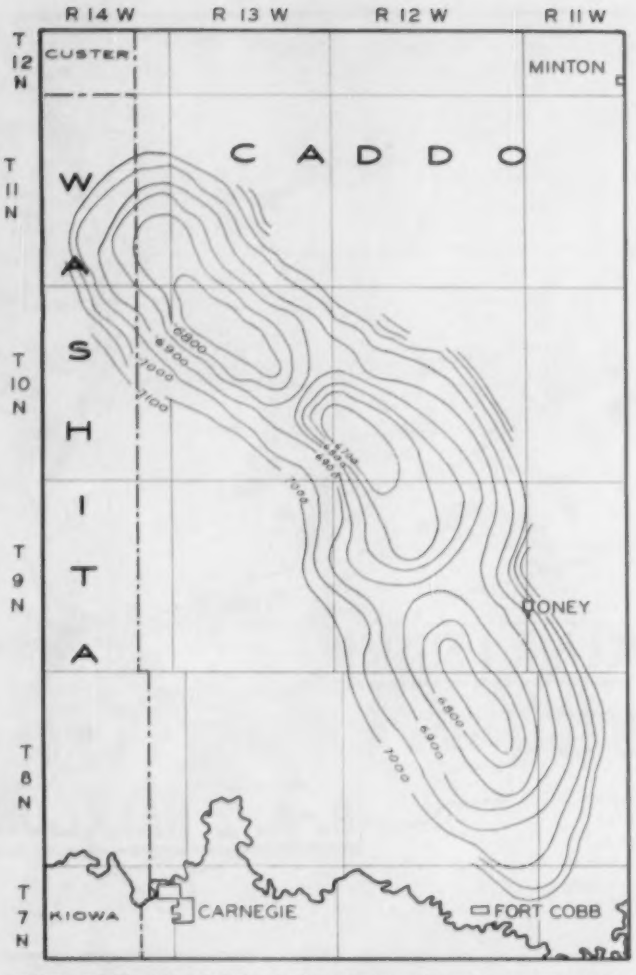
It is emphasized that the outlined areas are only those of known interest due to past drilling activities, lease acquisitions, or apparent from seismic and subsurface control. Undoubtedly there are other areas in western Oklahoma offering deep producing prospects not generally as well known or have not been tested by deeper drilling. The depths reached and results of exploratory drilling on the several prospects are reviewed below.

. . . Cheyenne (Roger Mills County). Gulf Oil Corp. and Sinclair drilled a test on this feature reaching a total depth of 14,503 ft. still in Pennsylvanian beds. Attempts to complete in Hoxbar and shallower formations yielded only small volumes of gas and the test was abandoned.

. . . West Thomas (Custer County). The first test on this structure was drilled by Parker Drilling Co. reporting Upper Mississippian at 11,795 ft. and reaching a total depth of 11,973 ft. Good showings of gas and condensate were logged in the Springer but attempted completion as a commercial producer was not successful.

Subsequently Magnolia has drilled two additional tests of the Springer sands under this structure reaching total depths of 11,672 and 12,026 ft. respectively.

. . . Arapaho (Custer County). A test of this structure was first drilled by V. A. Brill reaching a depth of 9,354 ft. Later Parker Drilling Co. moved in and deepened the hole to 13,859 ft. In attempting to core from 13,851 to 13,859 ft. in the basal Morrow sand the well blew out (making gas and some condensate) and the hole was lost.



FORT COBB ANTICLINE, Caddo County. Seismic structure datum-middle Pennsylvanian. Interval-50 ft. Map furnished by K. A. Ellison, Oklahoma City.

. . . East Bessie pool (Washita County). Gulf discovered this pool with small production from a Deese sand at 12,292 ft. after drilling to a total depth of 12,559 ft. still in the Des Moines series of Pennsylvanian age.

. . . Cordell (Washita County). Several tests have been drilled on this prospect. However, the deepest was drilled by Stanolind Oil & Gas Co. in 36-9n-17w reaching a depth of 13,505 ft. in the Springer.

. . . Fort Cobb anticline (Caddo and Washita counties). This is one of the largest and better known structural features of the Anadarko basin. It has been explored and defined by a number of oil companies and independent operators using seismic survey methods. The structure also is so apparent by subsurface control from the several wells drilled on or near the anticline.

An interpretation of the structure by seismograph is shown by the map of the Fort Cobb anticline based on reflections from a middle Pennsylvanian horizon. The structure is a northwest to southeast trending anticline enclosing three local areas of higher relief. The anticline has a vertical closure of 300 ft. on the shallower formations with an increase in vertical closure to over 600 ft. with depth. The feature underlies portions of 10 townships with an areal extent of approximately 93,000 acres.

Five exploratory tests have been drilled on the Fort Cobb anticline. The deepest was Superior Oil Co. of California's 51-11 Weller located in 11-8n-12w on the south portion of the structure. In 1947 this was the world's deepest well when a total depth of 17,823 ft. was reached. Oil and gas shows were reported from numerous sands in the Hoxbar, Deese, Dornich Hills, and Springer formations.

Casing was set at 16,345 ft. but attempts to complete as a commercial

(Continued on page 179)

AXELSON PICTORIAL

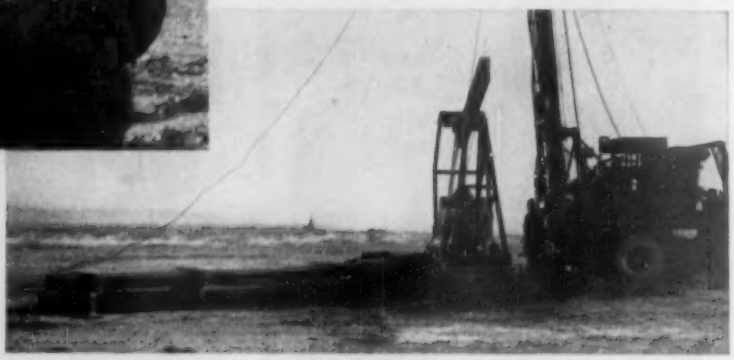
PALOMA. This well (Chanslor-Western Oil Development #34-55) is 100% Axelson equipped with rod-type pump (2 x 1¼ x 36 x 40), a 4-step Axelson sucker rod string (#59 rods), and an Axelson 25 ft. Hydraulic Pumping Unit. Pump shoe will be set at 11,532 ft. Checking equipment is Don Donley, Axelson District Manager, Bruno Clouse, Production Foreman for CWOD, and Leonard Morgan, Toolpusher, CWOD.

2 MILLION BARRELS. George Ledbetter (left), Production Foreman, Bakersfield Division, General Petroleum Corporation; and Earl Colvin, Axelson Representative, at the Glide 21 No. 10 in the Mount Poso Field, Kern County, California. A 4" x 3¾" x 11' Axelson Tubing Pump equipped with Duax Liners and a 48" minus 3 heavy chrome-plated grooved plunger is in service. As of March 9, 1956, the pump has produced over two million barrels of gross fluid averaging 2,250 BPD over a 2½ year span without having been pulled.

ODESSA WAREHOUSE. The Axelson sales office and warehouse, located at 2512 West 2nd Street, Odessa, is the center for hydraulic pumping units in West Texas and Southwest New Mexico. Immediate delivery, installation and service originate from this point. Call Federal 7-8391 for prompt attention to your pumping requirements in the Permian Basin.

PROTECTION PAYS OFF. Wendall Weaver, Roustabout for Forest Oil Corporation, removes the protective caps from the ends of ¾" Axelson Sucker Rods. Both box and pin ends of Axelson rods are protected to keep dirt out of threads during shipment and storage. S. J. "Sid" Ingram, Field Superintendent looks on.

ON THE PUMP. Forest Oil Corporation's Blakeney "M" 2-H at East Goldsmith, Texas, is going on the pump. Alexson ¾" #59 sucker rods have just been delivered. These rods are made from a nickel-modybdenum alloy steel fully normalized and tempered from end to end. They are recommended for wells in which heavy loads and corrosion are a problem.



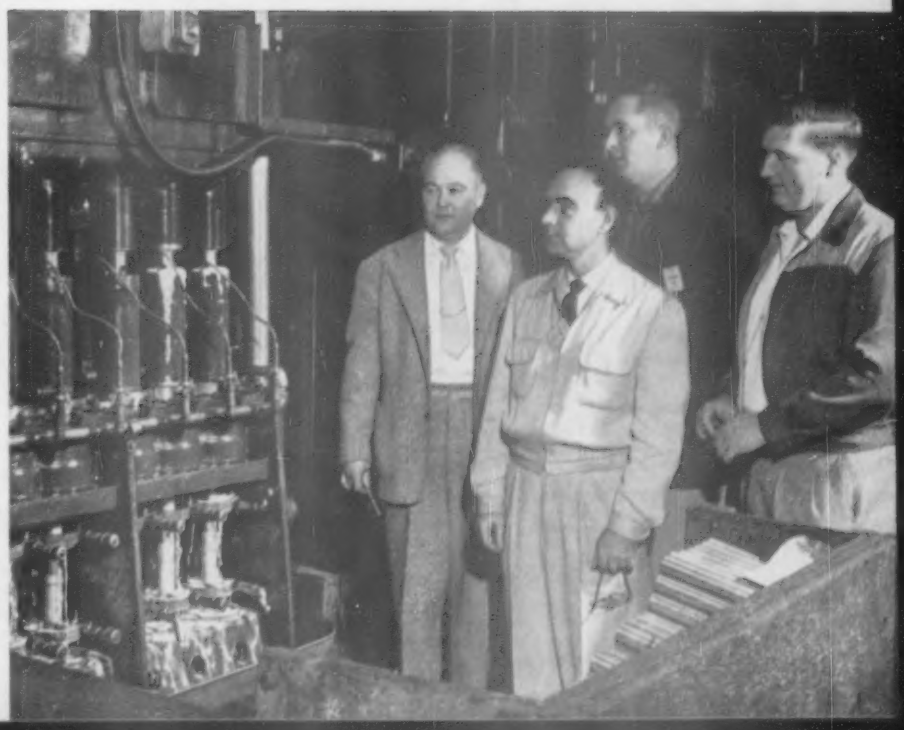
W. O. C. Pumpers J. F. Ham (left) and E. J. Little, Magnolia Petroleum, wait on cement during a squeeze job in progress in the Geo. Hearder #1, Brownfield District, Andrews County, Texas. Too much water in production called for remedial work. The Axelson Hydraulic Long Stroke pumping unit will be reset at a different level to get maximum production at reduced pumping rates.

GOVERNOR. Visiting the Axelson booth at a recent industrial exposition in Los Angeles, was Goodwin J. Knight, Governor of California, with the Governor are Mrs. Doug Lance (center), wife of Axelson's Sales Promotion Manager and Mrs. Knight.

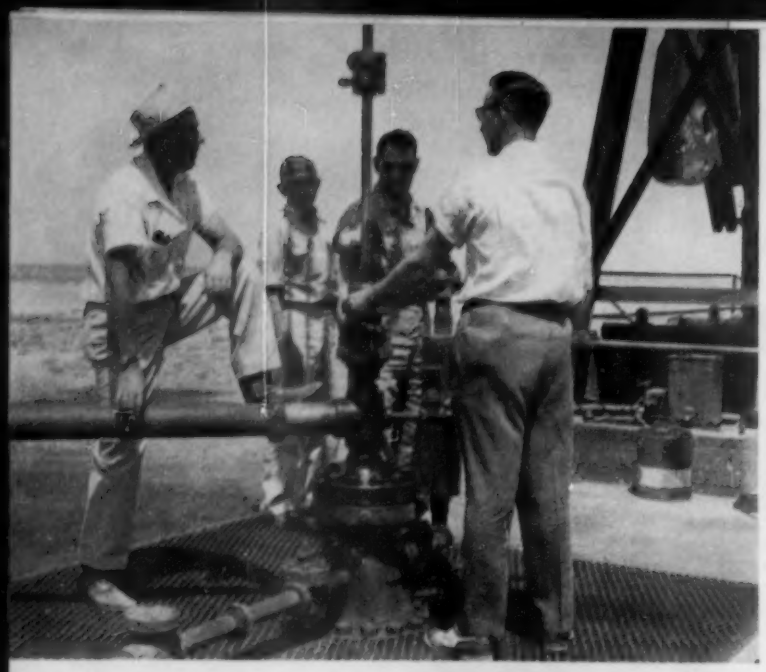
AXELSON PICTORIAL

SLOW MOTION. In the beautiful pine-tree country around the Lake Charles District, Louisiana, this Axelson Hydraulic Long Stroke Unit pumps 156 BPD from a depth of 8,600 ft. @ 3½ strokes a minute with a 26½ ft. stroke. The slow, smooth, steady loading of these powerful pumping units reduces stresses on sucker rods and on the moving parts of subsurface pumps, thereby increasing their life manyfold. This well is Magnolia Petroleum's Lutcher Moore #C-2.

IN FOCUS. This is Drilling & Exploration Company's able well service crew on the job in the Wasson Field, Texas. These fellows have installed many an Axelson pump and sucker rod string which are sold and serviced through the local Jones & Laughlin Supply Stores. (From left to right) Garnice Land, Clint Westbrook (Gang Pusher), Stanley Smith.

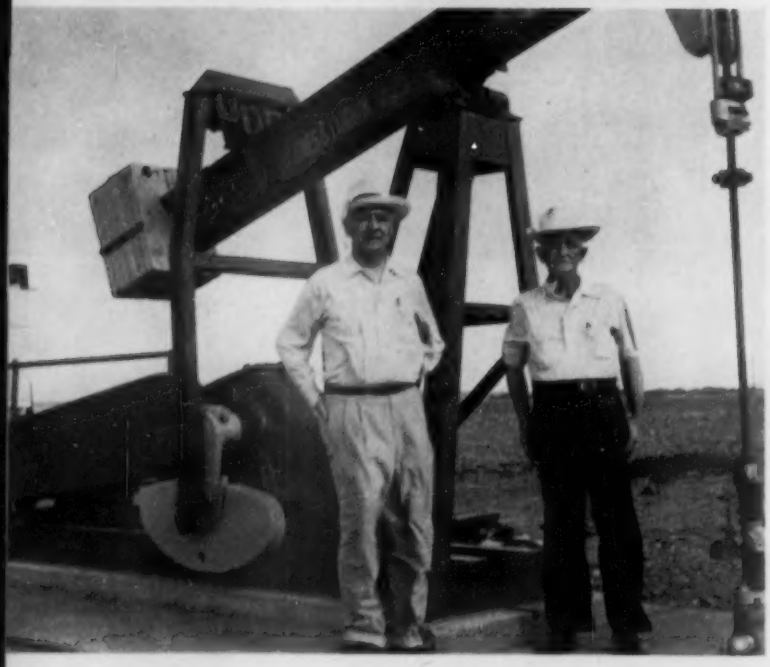


FOURSOME. Viewing the liner-boring machine at Axelson's Los Angeles plant: (left to right) Phil Humphreys, Axelson Petroleum Sales, Los Angeles; Jay Gordon and Andy Throop, Union Oil Company Production Foremen, Dominguez District; Al Thompson, Axelson Factory Representative, Long Beach. Petroleum personnel frequently make a tour of Axelson's vast manufacturing facilities and are always welcome.



AXELSON PICTORIAL

HOT ONE. This is Amerada Petroleum Corporation's Mathers A#2, East Cap Rock Field, Lea County, New Mexico. An Axelson 2¾" bore TLE Pump lifts 1,350 B/D (75 bbls. net of 45 gravity oil). Total depth is 11,030 ft.; pump is set at 3,573 ft. Bottom hole temperature of 180° F. does not affect the pump. (l. to r.) Buck Cummings, Farm Boss; Carl West, Pumper; Gene Thomas, Resident Engineer (all of Amerada); Truman Coffee, Axelson Representative.



RETIRING. W. A. Underwood (right), Production Foreman for Cosden Petroleum for 13 years, retired on June 30, 1956, after 50 years of service in the oil fields. He poses for his picture beside the Patterson #1, Howard County, Texas, with Bernard Layman, Jones & Laughlin Field Representative. Axelson Sucker Rods and Plunger Pump are going strong in this well. Depth is 3,100 ft. Production is 100 B/D of 31 gravity crude oil.

NO. 7

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CALIFORNIA: *Axelson stores at Bakersfield, Coalinga, Huntington Beach, Long Beach, Orcutt, Santa Fe Springs, Taft, Ventura; Hickey Pipe & Supply Co. (Sucker Rods)* • **MID-CONTINENT:** *Jones & Laughlin Steel Corporation, Supply Division (Headquarters, Tulsa)* **ROCKY MOUNTAINS:** *Jones & Laughlin Steel Corporation, Supply Division; Great Northern Tool & Supply Co., Billings, Montana* • **CANADA:** *Jones & Laughlin Steel Sales Co. Ltd., Calgary; Dominion Oilfield Supply Co. Ltd., Calgary* • **MEXICO, D. F.:** *Wells Fargo & Co. Express, S. A.* • **RIO DE JANEIRO, BRAZIL:** *MAQUIP (Commercial de Maquinas e Equipamentos) S. A.* • **LIMA PERU:** *Gross Equipment, S. A.* • **LA PAZ, BOLIVIA:** *Del Prado & Compania, Ltd.* • **BUENOS AIRES, ARGENTINA:** *Adrian Bolland & Cia., S. R. L.* • **BARCELONA, VENEZUELA:** *Servicios Industriales, C. A.* • **MARACAIBO, VENEZUELA:** *Servicios Industriales, C. A.* • **BOGATA, COLOMBIA:** *Servicios Industriales, C. A.* • **TRINIDAD, B. W. I.:** *Industrial Agencies, Ltd.*

Where to buy Axelson Hydraulic Pumping Units:

CALIFORNIA: *Axelson stores (see above)* • **ODESSA:** *Axelson Warehouse* • *Industrial Supply Company stores at* **DALLAS, ELECTRA, FORT WORTH, FREER, HOUSTON, KAMAY, MIDLAND, ODESSA, SAN ANTONIO, SNYDER, TULSA, TURNERTOWN, WICHITA FALLS** • *Mountain Iron & Supply Company stores and offices at* **ANTHONY, AUGUSTA, BARTLESVILLE, DENVER, GREAT BEND, INDEPENDENCE, KIMBALL, LEROY, MADISON, McPHERSON, PARKERSBURG, PLAINSVILLE, RUSSELL, TULSA, WICHITA** • *Export (See above).*

producer were unsuccessful. The four shallower tests drilled on the anticline also reported showings of oil and gas. Of these four Continental Oil Co. 1 Smith located in 32-10n-12w, near the center of the anticline, was drilled to a total depth of 13,515 ft. It was completed as a small pumper from perforations 9,196 to 9,240 and 9,550 to 9,598 ft. in the Hoxbar.

More drilling . . . Although the several tests drilled on the above prospects have not resulted in commercial production, this does not justify condemning the entire Permian and Pennsylvanian producing prospects for the deeper portions of the Anadarko basin. For example, in 1939, Continental Oil Co. drilled a deep Pennsylvanian test on a seismic anomaly that has since become the southeastern flank of Elk City field.

Although showings of oil and gas were reported, this test missed the oil, gas, and gas-condensate bearing facies of the Hoxbar. In 1947 Shell Oil Co. drilled a well a few miles farther west resulting in the discovery of Elk City field with a 100-million-barrel reserve from around 300 producers. Further exploration of the Permian and particularly the Pennsylvanian formations should be encouraged by the numerous oil and gas showings encountered by the several tests drilled to date.

Deeper drilling . . . A great potential for the deeper portions of the Anadarko basin are the producing prospects of the pre-Pennsylvanian formations. Actually very little is known concerning the structural position or lithological facies of the undrilled pre-Pennsylvanian formations near the deepest part of the basin. There is the possibility of structural deformation before basin subsidence.

In this event the early Pennsylvanian movements probably intensified the existing folds and resultant anticlinal structures. It has been demonstrated in many areas that depth itself does not preclude porosity and permeability nor oil and gas production. The controlling factors are the finding of reservoir rocks and in a position for entrapment and accumulation of petroleum.

The producing possibilities of the pre-Pennsylvanian formations, such as Mississippian (Chester and Sycamore), Devonian (Hunton), and in particular, the Simpson group (Bromide, Tulip Creek, McLish, Oil Creek, Joins) of the Ordovician, have been demonstrated in border areas of Anadarko basin.

These same formations offer exceptional prospects for the present producing and nonproducing structures near the trough of the basin.

Depth requirements . . . The Fort Cobb anticline by being located near the deepest portion of the basin is indicative of the depth requirements to reach the pre-Pennsylvanian formations.

The deepest well drilled on this structure was the Superior 51-11 Weller that reached a depth of 17,823 ft. It lacked an estimated 500 ft. of reaching the Caney shales of Mississippian age. Extrapolation, based on known thicknesses, gives an estimation of depths to several pre-Pennsylvanian formations as follows:

Formations—	Depth (ft.)
Mississippian	18,300
Hunton	21,500
Viola	22,400
Simpson (Bromide)	23,000
Arbuckle	24,600

It is estimated that the penetration of all the potentially productive horizons under the Fort Cobb anticline would require drilling to a depth of around 25,000 ft. However, a good indication of the producing prospects for the anticline would be a test of the upper Simpson (Bromide) sands at a depth of approximately 23,000 ft.

Cost . . . It is estimated that it would cost $1,500,000 to drill to a depth of

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Stone & Webster Securities Corporation (Incorporated) — White, Weld & Co.

Drexel & Co. — Dean Witter & Co.

November 19, 1956

23,000 ft. In addition to drilling, this estimate includes the cost of various size casings, drilling mud, logging, coring, and other necessary services.

Method . . . An experienced contractor stated that the secret of drilling a deep hole was—"drill as large a hole as possible, as deep as possible, and as straight as possible."

In the past many scheduled deep tests ran out of hole size or working room before the depth objective was reached.

A tentative casing program for a 23,000-ft. test would be as follows:

Set 13⅜-in. casing for surface pipe, 10¾-in. pipe at 6,000 ft., drill a 9⅞-hole to approximately 17,000 ft. where 7⅝-in. casing would be landed. This would allow adequate hole size to drill to 23,000 ft. where 5½-in. liner could be set for completion.

Spacing . . . The development of oil and gas production below a depth of 15,000 ft. will necessitate wide spacing per well. Assume that an operator has drilled a 23,000-ft. well at a cost of $1,500,000, and it results in a producer with an ultimate recovery of 20,000 bbl. per acre for which the operator will net (after taxes, royalty oil, and operating costs) $2 per barrel. It would require draining 40 acres just to recover the cost of the well.

A spacing of 160 acres would only represent a profit of 3 to 1, disregarding discount factors. Obviously, less oil recovery or a gas-condensate reservoir would require even greater drainage areas per well to make such ventures economically profitable.

From a material standpoint, there is enough steel by weight in a 23,000-ft. well to furnish casing for approximately 50 shallow (2,500-ft.) wells. The casing for a deep well must be of better quality, heavier, and costs more per ton than that required for shallower wells.

It is apparent that the high development costs of deep production will necessitate and justify wide spacing. It is expected that this spacing will be one well per section giving a drainage area of 640 acres for each producer.

Unitization . . . There are not many individuals or even oil companies with sufficient risk capital to independently explore and develop oil and gas reserves below 20,000 ft., even though the future return may be very profitable. One method of reducing individual risk is by the formation of operational units.

The Fort Cobb anticline is used to illustrate what could be accomplished. Seismic exploration indicates the Fort Cobb structure to have an areal extent

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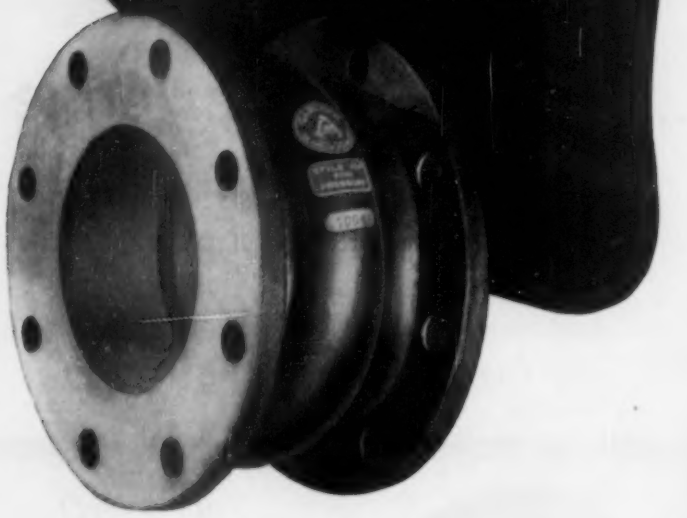

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of approximately 90,000 acres of which nearly all is under oil and gas lease. It is estimated that the cost of a 23,000-ft. test on the anticline would be $1,500,000. The formation of a 90,000-acre unit would result in each participant's cost for this test being less than $17 per lease acre.

This example may appear rather extreme but is entirely plausible. It is expected that the deep prospects of the Anadarko basin will cause the formation of a number of such units for both exploration and development. Unitization may even extend to mineral ownerships to protect correlative rights due to expected wide spacing per well.

EXPLORATION HIGHLIGHTS

PACIFIC COAST

CALIFORNIA

Sunset Scores at Gonyer Anticline

Sunset International Petroleum Corp. chalked up a new field discovery on the Gonyer anticline 5 miles southwest of Taft in Kern County. Sunset brought in 1 Continental flowing 53 bbl. daily of 15°-gravity crude from the interval 1,685-1,798 ft. after a Sandfrac job on the shallow wildcat. Sunset is operator for itself and Continental Oil Co. on a 3,778 acre lease surrounding the discovery well. The new field is about 3 miles west of the huge Midway-Sunset field. A Sunset spokesman said their next test would be taken down to at least 2,800 ft. to test a second interval believed to lie under the discovery zone.

New Fault Block Find

Macson Oil Co. gave the small Cascade-Bee Canyon field in Los Angeles County a new fault block discovery

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FORT WORTH, TEXAS

Frank Watts, left, veteran store manager for an independent distributor, having a branch at Bay City, Tex., and H. P. (Pat) McGuirt, tool pusher for Otis Russell Drilling Co., watch Pittsburgh Seamless casing being unloaded at a rig near Damon, Tex.

Santa Claus Must Wait When Oil Field Emergency Arises

It's shortly after midnight as Frank loads a swedge from his store for delivery to the Damon well.

Once he's at the well, Frank sits down in the bunk house with Mr. McGuirt to go over an order for delivery the next day.

Here's Why You Can Rely On Pittsburgh Steel's Independent Distributors

'Twas the Night Before Christmas in Bay City, Texas, as Frank Watts, his wife and their children retired for the night.

A few hours later—4 a.m., to be exact—Frank was awakened—not by Santa Claus and his reindeer, but by a telephone call from a driller 35 miles away.

Due to an unavoidable incident a small valve was needed immediately.

Because Frank Watts is a veteran supply man and manager of an independent supply company store (representing Pittsburgh Steel Company) in Bay City, he knew the importance of the driller's call. Holding up drilling costs money, whether it's Christmas morning or the 23rd of July.

Frank was on his way quickly, opened the store, got the valve, delivered it and made it back home in time to watch the kids open their gifts at 8 a.m.

This was not an unusual event as his wife recalls any number of times when Frank has shown up at dawn due to similar emergencies. For example, there was the night when he made a round trip to Houston (180 miles) for $12.00 worth of parts he was temporarily out of and which were badly needed on a rig.

At 36, Frank Watts is a tall, raw-boned, friendly man the movies would cast as a typical Texan. But more important, he's an oil field businessman, a representative of one of the 18 independent distributors (listed at right) handling Pittsburgh Seamless. And he has nearly 15 years of experience under his belt.

He is accustomed to working 65 hours a week and it doesn't bother him to get frequent night calls, half of them to open his store so a driller can get an item he needs, the other times an SOS for delivery of supplies to keep a drilling operation going.

Frank Watts has "service" as his first and strongest business byword. Quality of the products he handles is a close second. As he puts it:

"I learned a long time ago that service and the best products available are the keys to profit and success in this supply business.

"If we handle only good quality stuff, proven material the men at

An oilman's assurance of quality—Pittsburgh Seamless—is the topic of this conversation Frank is holding at the well-site.

Frank watches cat-heading of Pittsburgh casing as it is run into hole. Frank's company handles a full range of Pittsburgh Drill Pipe, casing and tubing.

the rigs can rely on, and give them all the service they need, we'll get their business and we'll keep it."

Those words stand as testimony to the quality of Pittsburgh Steel Company's drill pipe, casing and tubing. The company Frank works for handles only Pittsburgh drill pipe, although it offers several manufacturers' casing and tubing.

They prove, too, why the independent supply house has become such a vital force in the oil and gas fields.

Independent distributors are ready for action around the clock. Frank's store stocks nearly 3,000 different items ready for delay-free normal operation or for emergencies.

An independent distributor's service is flexible. The independents are personal friends to the oil men they serve. Through their long experience, they know the problems oil men face and can meet their requirements without red tape and extra paper work. They are free from remote control and can make big decisions without wasting time. The independent store is usually the first in an oil field and the last to leave, if it ever does. Its personnel live in the area their stores serve. Their own personal futures are tied to the success they generate for themselves.

Independent distributors help keep costs low. Though they specialize in service, their prices are competitive. Their livelihood depends on meeting competition. Almost with no exception, the independent's representative will stay in the area of his store, not move on every couple of years. The money the independent makes stays where he makes it.

The independent offers only the best in equipment because he buys only what he wants to buy. He is free to select from the best equipment made. Pittsburgh Steel and all the other reputable manufacturers back up the independent distributor.

Independents are the most accessible suppliers in the oil fields. For example, Pittsburgh Steel's distributors have a total of 140 stores in all parts of the oil and gas fields.

Next time you buy drill pipe, casing or tubing use the team that can't be beat: Pittsburgh Seamless and your independent distributor.

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Buckeye Supply Company
18 Harrison Street
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C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
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New York 7, New York

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McJunkin Corporation
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Rated for 10,000 psi at 150°F., each carbon steel bar stock valve is individually tested at 15,000 psi before leaving the factory. They are supplied in sizes from ¼ to 1", in globe and angle styles with female ends, male and female ends, or male union ends. They can be furnished in 12-14 chromium stainless steel and 18-8 molybdenum stainless steel for corrosive applications. May also be supplied with special stellite discs for extra abrasion resistance in extremely severe throttling services. Those other than carbon steel are rated at 4,000 psi at 150°F.

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with completion of 10 Mission O'Melveny for 134 bbl. daily of 25°-gravity crude. Macson's wildcat is producing from the Cascade zone, the top of which is at 3,428 ft. The operator has 355 ft. of the zone open. The discovery is about ½-mile west of Cascade-Bee Canyon field main producing area.

New Santa Fe Wildcat Attracts Interest

Santa Fe Springs field operators are watching with interest a wildcat being drilled by Edward Nepple more than 1 mile west of the recently booming Santa Fe zone activity in the old Los Angeles basin field. Nepple's test, 1 SP-Pedro-Nepple, flowed 600 bbl. gross rate on a 21 hour production test with a 16/64-in. choke at 9,762 ft. The crude tested at 35° gravity, 50 per cent cut. Nepple was preparing to deepen the hole.

Union Plugs Back Stenderup Offset

Union Oil Co. was plugging back its first offset to 55-X-21 Stenderup in the Arvin area of Mountain View field, Kern County, for a completion in the Derby sand after an unsuccessful search for deeper Vedder production. Union took this offset to 10,331 ft. before deciding to come back up hole for Derby sand production.

GREAT LAKES

MICHIGAN

The most encouraging and prospective oil well development in Michigan now appears to be a new test located only 1,980 ft. east of the most easterly Traverse oil producer in Edmore field, Home Township, Montcalm County. Edmore pool was discovered in 1933.

This new potential producer, drilled by E. Edwin Brehm at the 1 Long Estate, NE NW NW 11-12n-6w, logged a structurally high Alpena Traverse oil pay and appeared to offer prospect of extending this field into new, virginal and important Michigan oil reserves. Alpena Traverse was topped at 3,066 ft. Oil pay was drilled at 3,088-89 ft. An exceptionally good head of gas showed immediately and hole carried 800 ft. of clean oil, no water, in 14 hours. Fill-up increased to 2,200 ft. in 24 hours with hole partially bridged by cavings at 3,068 ft., point where hole was reduced before pay was drilled and where 5-in. casing was being set.

Structurally, this new well was checked in 6 ft. higher on pay than highest producer in the pool; 9 ft. higher than the nearest producing well,

and 15 ft. higher than the lowest commercial completion in the pool. This well, with from 6 to 8 ft. of additional pay remaining to be drilled (on the basis of amount of pay found in older wells), may open far more acreage to the drill than was proved up during the pool's original development.

An extension of this pool will not be a big surprise to those who have followed the producing history of the original 90-acre Edmore Traverse pool. In all, 11 producers were drilled and completed. Seven are still on production. At least one is flowing and others have only recently been equipped with pumps. Total recovery per acre to Jan. 1, 1955, was 6,326 bbl. Cumulative production to same date was 569,314 bbl. Total production from 7 producible wells in 1955 was 10,102 bbl. The old pool produced an average of only 132 bbl. of salt water a day in 1955. At present there are no close in condemning control points to the east and southeast.

APPALACHIAN

OHIO

An untapped gas pool was found ½ mile west of oil production at Spring Mountain in Monroe Township, Coshocton County. The Mammoth Producing 1 John Snow, Section 8, gaged 950,000 cu. ft. natural and 4,500,000 cu. ft. after fracture with a rock of 1,040 lb. from Clinton at 3,220-41 ft.

● The three-horizon gas pool in western Knox Township, Holmes County, was extended a location to the east by Ohio Fuel 4 R. E. Spreng, Section 29. Clinton sand was logged at 3,060-79 ft. with 550,000 cu. ft. natural and 4,720,000 cu. ft. after fracture.

● Barton Hall et al moved out ⅓ mile to the southwest of oil production at Maysville in Green Township, Hocking County, and completed a fair well on 1 John Cook, Section 23. Clinton at 3,113-41 ft. made 45 bbl. in 24 hours after fracture.

WEST VIRGINIA

In Edray district, Pocahontas County, West Virginia, Logan Gas Development Co. has announced location for 1-F-19150 Cherry River Boom & Lumber Co., rank wildcat, elevation 3,432 ft., Mingo Quadrangle, 1.50 miles south of latitude 39 degrees 25 minutes, 1.90 miles west of longitude 80 degrees 10 minutes.

● Dry Fork district, Randolph County, Columbian Carbon Co. 1239 U.S.A., elevation 3,448 ft., reached the chert at 5,172 ft., and is drilling at 5,174 ft.

● Hope Natural Gas Co. 10000 U.S.A., elevation 3,385 ft., reached this formation at 5,627 ft., and shut down at 5,628 ft., to run 7-in. casing.

PENNSYLVANIA

Young Township, Indiana County, Southwest Pennsylvania, Manufacturers Light & Heat Co. 1 R. & P. Coal Co. is drilling at 5,480 ft. In No. 4 the same tract, casing is being run at 1,141 ft.

● In Armstrong Township, Peoples Natural Gas Co. has started drilling in 4108 and is at 95 ft.

● Mount Pleasant Township, West-

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moreland County, this company's 4105 Benedictine Society is at 290 ft.

EASTERN KENTUCKY

Kentucky West Virginia Gas Co. has completed its deep wildcat test 1 Phillip Dingus as a light gas well. Located on Arkansas Creek in Floyd County, well bottomed at 5,118 ft. in Trenton lime topped at 4,610 ft. Other significant markers were: Berea 1,956 ft., Devonian shale 2,060 ft., Corniferous lime 2,800 ft., Big Six sand 3,337 ft. and Clinton shale 3,391 ft. Hole was plugged back to 2,640 ft. and the Devonian black shale shot from 2,063 to 2,606 ft. where an initial open flow of 61,000 cu. ft. of gas per day was recorded.

EASTERN INTERIOR

ILLINOIS

In Franklin County, 7 miles northwest of Benton, Kewanee Oil Co. has an oil discovery at 1 Plains, SE SE NW 11-5s-2e. The discovery flowed 343 bbl. of oil in 20 hours through choke from fractured Renault sand at 2,673-92 ft. The well is shut down for tank space.

Just ¾ mile to the north the 2 Plains, SE NW SE 2-5s-2e, is preparing to test in the same pay at 2,698-2,720 ft. A drill-stem test at 2,690-2,720 ft. recovered 1,445 ft. of clean oil, 300 ft. mud-cut oil, and 300 ft. salt water.

- In Clay County, 2 miles west of Clay City, Grant W. Breuer 1 L. M. Crickman et al, NE SE SW 15-3n-7e, is an indicated Aux Vases discovery at 2,876-2,912 ft. Recovery on a drill-stem test recovered 2,040 ft. of gas, 85 ft. of clean oil.
- In Edwards County, 4 miles southwest of Albion, Calvert Drilling Co. 1 Noel Everett, SW SE NE 29-2s-10e, swabbed 218 bbl. of oil and 20 bbl. water per day from the Aux Vases at 3,180-98 ft., after fracture. This wildcat discovery has been placed on pump.

MID-CONTINENT

NORTH TEXAS

Redrilling in Taylor County Adds Two New Pays

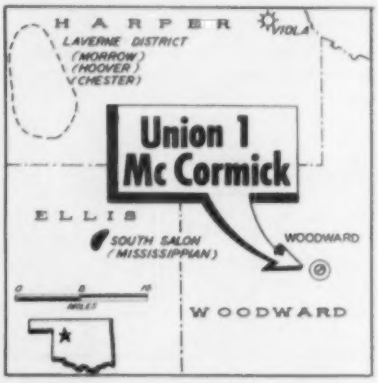
Geochemical Surveys, Inc., has recompleted two wells in the Gibson field 2 miles southeast of Merkel, Taylor County, and has opened Upper and Lower Hope producing zones. Regular pay at Gibson is the Flippen limestone.

Hope sand is below the Flippen, and is of Cisco age. In Gibson field, the Upper and Lower Hope zones are being called Frazier 2 and Frazier 3 zones.

Geochemical Surveys 1 Price, Subdivision 7, Grimes CSL, last week was given a pumping potential of 66 bbl. of oil a day, with no water. Gravity was 40° and GOR was 250:1. Perforations were from 2,730-34 ft. No. 1 Price logged the Flippen at 2,549 ft., Frazier 2 zone at 2,704 ft., and Frazier 3 zone at 2,720 ft.

The second well in the Hope pay was Geochemical Surveys 1 W. T. Curb, in the same subdivision. Potential was 72.9 bbl. of 40° oil, on the pump, from pay at 2,716-22 ft.

Nearest comparable production is in Redding field, 7 miles to the northeast.



Union Oil Co. of California has an indicated discovery in nonproducing Woodward County, northwestern Oklahoma. The 1 McCormick, SE SE NW 14-22n-20w, southeast of the city of Woodward, will take production tests of the Morrow-Pennsylvanian sand at 8,233-87 ft. Total depth is 8,495 ft. Tidewater Oil Co. has begun operations at a ½-mile north extension try with projected depth 8,500 ft. Success at the Union wildcat would open first production in the county, marking a new Morrow milestone in the Hugoton embayment province.

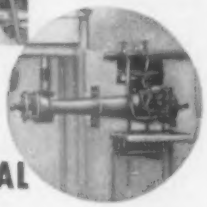
HUGOTON EMBAYMENT

TEXAS PANHANDLE

Tonkawa Wildcat Flows Gas on Test in Hansford

A Hansford County wildcat flowed gas at the rate of 1,500 M.c.f. per day in 3 minutes, 3,000 M.c.f. in 12 minutes, and 4,000 M.c.f. per day in 45 minutes on a drill-stem test of the Tonkawa-Pennsylvanian sand at 6,320-75 ft. The new discovery is Spincknall Enterprises 1 S. P. Miller estate, ¾ mile west of Bernstein field and 7 miles northeast of Gruver townsite in the north-central part of the county. Specific location is in Section 14, Block 2, SA&MG Survey.

VERTICAL



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Tests Scheduled for Dalhart Basin Wildcat

A drill-stem test is due Standard Oil Co. of Texas' 1 W. H. Latham "5", a Hartley County wildcat, 4 miles southeast of Twist in the Dalhart basin of far northwestern Texas.

The wildcat recovered 2,650 ft. of gas in drillpipe on drill-stem test at 5,418-36 ft., 180 ft. of free oil, and 20 ft. of mud and 1,200 ft. salt water. The new test will be made near 6,406-22 ft. A test in the Wolfcamp at 4,592-4,604 ft. recovered 270 ft. of free oil and 30 ft. heavily oil-cut mud. Location is in Section 125, Block 48, H&TC Survey.

There are only two small oil producing fields in the Dalhart basin, Rehm and Bivins fields, both in Hartley County.

SOUTHWEST KANSAS

Small Pumper Completed In Ford County

Pure Oil Co. and Ohio Oil Co. completed the 1 Konda Mississippian discovery in Ford County, 7 miles northwest of Pleasant Valley field. Location is in C NW SW 11-27-22.

The discovery pumped 44 bbl. of oil per day from perforations at 5,010-30 and 5,022-42 ft.

ARK-LA-TEX

EAST TEXAS

New Pool Discovery in South Slocum Area

Thomas D. Humphrey & Sons have asked for new-field designation for their 1 E. H. Bishop, 1 mile east of West Slocum field and 1 mile south of Slocum townsite. Location is in W. R. Wilson Survey, A-66.

On 24-hour completion gage, the well flowed 134 bbl. of 38.9° oil on 10/64-in. choke. Perforations in the Sub-Clarksville were from 5,698-5,702 ft. Tubing pressure was 720 psi, and gas-oil ratio read 772 : 1. Top of pay was 5,694 ft. Operators have requested the name David-Gail be given the area.

ROCKY MOUNTAIN

NORTH DAKOTA

Gas Tested at Beaver Lodge Deep Test

Amerada Petroleum Corp. tested gas at the rate of 3,000 M.c.f. per day at its 1 Iverson-Nelson, NW SE NE

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2-155n-96w, deep test inside Beaver Lodge field, Williams County.

The gas flowed during a drill-stem test at 11,187-11,574 ft.

MONTANA

Amerada Continues Tests At Sheridan Prospect

Amerada is testing its 1 Tange in C NE SE 20-36n-53e, important oil prospect for Sheridan County in northeastern Montana's portion of the Williston basin. The latest test recovered 180 bbl. of water with an oil trace from Red River-Ordovician perforations at 9,812-50 ft. The operator squeezed this set of perforations and is now swabbing at 9,760-9,802 ft. Top of the Red River is at 9,582 ft.

Another test in the Winnipeg at 9,920-32 ft. recovered salt water. This wildcat is an indicated Silurian discovery at 9,050-9,230 ft. Oil flowed at the rate of 20 bbl. of fluid per hour on test at 9,050-9,230 ft.

COLORADO

Testing Under Way At Permian Hopeful

The California Co. is testing its 1 Brunner, an indicated Lyons-Permian sand discovery in C SW SW 26-7n-67w, Weld County. A drill-stem test at 8,960-90 ft. recovered 692 ft. of clean oil with the tool open 3 hours. Location of this new Permian prospect is 4½ miles south of Black Hollow field, another Permian producer (one of the two in the Denver basin). It is also located 10 miles southeast of Fort Collins, Colo.

WEST TEXAS-NEW MEXICO

SOUTHEAST NEW MEXICO

Lea County Completions Include Two Wildcats

Central Lea County gained two discovery completions, one in the Devonian and the other in Permo-Pennsylvanian pay.

The Devonian well is Sinclair Oil & Gas Co. and others' 1 F. J. Danglade, NW SE 15-16s-35e. Location is approximately 1 mile south of Townsend-Pennsylvanian field, and 2½ miles north of Pennsylvanian and Devonian production in Sho-Bar field.

On potential test the discovery flowed 484 bbl. of 60° oil in 24 hours through 12/64-in. choke, after treating perforations in Devonian dolomite at 12,638-68 ft. Flowing tubing pressure was 1,100 psi. and gas-oil ratio was 104 : 1.

No. 1 Danglade is on a 320-acre unit equally owned by Sinclair and Shell Oil Co., with Sinclair as operator. Sinclair owns 160 acres in the area outside the unit.

Completed oil strikes in Lea County. Sinclair 1 Danglade, (Devonian), is between Townsend and Sho-Bar fields. Cities Service 1-AX, (Pennsylvanian) is south of Vacuum field.

The Pennsylvanian, or Permo-Pennsylvanian discovery, is Cities Service Oil Co. 1-AX State, in SE NE 14-18s-35e, 13 miles southwest of Lovington.

The well rated a daily flowing potential of 1,022 bbl. of 41.6° oil, plus 439 bbl. of salt water, based on a 13½-hour flow of 577 bbl. of oil through ½-in. choke. Tubing pressure was 560 psi., gas-oil ratio was not reported. Perforations were from 10,945-65 ft.

Additional pay logged . . . Tennessee Gas Transmission Co. 1-A State-Kemnitz, southeast of the new Seaman pool, made several flows of oil while drill-stem testing in the Permo-Pennsylvanian at 10,737-63 ft. One gage was 155 bbl. of oil in 4 hours through ½-in. and ⅝-in. top and bottom chokes. Flowing pressure ranged from 1,060-2,560 psi., with gas-oil ratio around 1,300 : 1.

Eddy County location . . . Shell Oil Co. has filed application to drill a 15,300-ft. Devonian wildcat 24 miles southeast of Carlsbad. It will be 1 James Ranch Unit, located 660 ft. from south and 2,009 ft. from east lines of 36,22s-30e.

SOUTH TEXAS

SOUTHWEST TEXAS

Javalina Area Deep Test Opens Gas-Condensate Pay

A wildcat test drilled by Shell Oil Co. in western Hidalgo County, in the Rio Grande Valley, is productive of gas and condensate to open another deep-pay field.

It is the company's 1 Boston-Texas Land Trust, in the Segundo Flores Survey, 20 miles northwest of Mission.

Location is northeast of the Javalina gas area, near the Starr county line, where production is from 5,400-ft. Frio-Vicksburg sands.

Shell's discovery well has a potential rating of 3,100,000 cu. ft. of gas and 66.5 bbl. of condensate per day with pay at 11,174-11,218 ft. Shut-in pressure is 7,340 ft. Gravity of the condensate is 53.7°. Drilled depth was 11,311 ft.

One oil producer, the field's discovery well, has been drilled at Javalina. It was completed by Continental Oil Co. late in 1947, but has not produced since 1949.

Edwards Produces Gas in White Kitchen Discovery

Lee Brothers Oil Co., of Houston, has an Edwards discovery in the White Kitchen area, 2 miles west of Washburn Ranch field, in eastern LaSalle County.

Its 2 H. D. Storey, Sr., in H&GN Survey 141, is productive of gas with pay at 10,407-30 ft. (perforated interval). No gage of productivity has been taken, and the well now is shut in for connection and potential test.

White Kitchen's only other well is a small oil producer completed in 1954 in a 3,300-ft. Carrizo sand.

The area is 7 miles southeast of Los Angeles, and about 15 miles southeast of Cotulla.

TEXAS GULF COAST

Dual-Zone Gasser Opens Kleberg May-Area Field

Arkansas Fuel Oil Corp. has a dual-zone gas-discovery well 3 miles southeast of Riviera, in southern Kleberg County, in the lower coastal area. The discovery is designated as South May field, being about 2½ miles south of May field, opened by the same company in July 1955.

Producing zones of the South May well, 1 Leo Kaufer, are at 7,900 ft. and 8,350 ft. Flow from the upper zone was at the rate of 2,660,000 cu. ft of gas per day, recovering 15.6 bbl. of 54.9°-gravity condensate per 1,000,000 cu. ft. Shut-in pressure is 2,700 psi. The lower zone produced at the rate of 11,000,000 cu. ft. of gas per day with 24.8 bbl. of 60°-gravity condensate per 1,000,000 cu. ft. Shut-in pressure of 3,138 psi. Total depth is 9,515 ft.

The original May field is productive of oil from 9,300-ft. and 8,200-ft. sands, and gas from a 6,900-ft. sand. There are five oil wells and one gas well (a dual zone completion with one of the oil wells).

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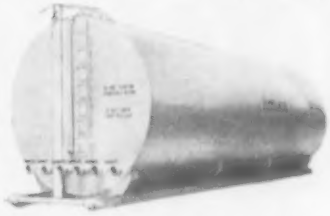

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SOUTH LOUISIANA

LOUISIANA GULF COAST

Bayou Perot Field Gets Long Stepout Producer

A step-out test drilled by California Co. 2 miles northwest of its Bayou Perot field, 17 miles south of New Orleans, in Jefferson Parish, is proving productive, opening an oil reservoir, perforated at 9,280-83 ft.

The discovery, at 12 Lester Pailet, in 2-16s-23e, is considered a long extension of production rather than a new field. The well is potentialed for 125 bbl. of 36.2°-gravity oil per day through 7/64-in. choke. The pay also is regarded as an additional reservoir although one of the main producing sands of the field is at 9,300 ft.

The field was discovered by California Co. in 1944. Ten productive wells have been completed with sands ranging in depth from 5,000 to 9,900 ft.

Deep Production Spreads In Gueydan Flank Play

Deep exploration around the north and northwest flank of the large Gueydan dome, on the Vermilion-Acadia parish line, has uncovered another gas-condensate reservoir.

Discovery is by Chicago Corp. at its 1 McBride, in 37-11s-1w, Acadia Parish. Pay zone is perforated at 11,352-54 ft. The well was opened through 5/32-in. choke, recording pressure of 6,800 psi. Production was ungaged.

Gueydan was discovered in 1932 by Pure Oil Co. The original and major portion of the field is on the Vermilion Parish side of the line with production from Miocene and upper Oligocene sands ranging in depth from 3,500 ft. to below 10,800 ft. Deeper production is in the more recent development around the north and northwest flanks in Acadia Parish.

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LOUISIANA OFFSHORE

Deep Production Proved In Main Pass Discovery

Magnolia Petroleum Co. is contributing another discovery to the long list of offshore fields opened this year. It is in Block 46, Main Pass Area, in Breton Sound, off the east side of Plaquemines Parish's delta peninsula.

Its discovery well, 1-A State Lease 2726, was drilled to 16,708 ft., but is completed in sand at 12,294-12,395 ft. (perforations).

Flow through 5/32-in. choke was at the rate of 264 bbl. of condensate with 3,000,000 cu. ft. of gas per day. Pressure of 9,600 psi. was registered.

Location is in the next block east of Kerr-McGee Oil Industries, Inc.-Phillips Petroleum Co.'s oil and gas-condensate field in Block 47.

WESTERN CANADA

SASKATCHEWAN

Manor Area Bags Mississippi Strike

The McCarty & Coleman group, who for a number of years have been carrying out exploration and development work in Saskatchewan and Manitoba, were rewarded during the past week with another oil discovery. This time the well lies in the Manor area of southeastern Saskatchewan, 8 miles south of that townsite, 25 miles northeast of oil production in Steelman field and 50 miles northeast of Estevan town.

According to unofficial reports received on the well, McCarty & Coleman 8-23 South Manor, on LSD 8, 23-6-1w2, a series of drill-stem tests were run around the 3,825-ft. level and

covering a 40-ft. section in the Mission Canyon zone of the Mississippian formation. Initial test in the zone recorded the best recovery giving up 2,070 ft. of 36°-gravity oil. A full 40-ft. section was covered by the test operations which started immediately at the top of the horizon. The first two tests both gave up oil, the third was classed as a misrun while the final test, beginning 23 ft. below the contact point indicated that the water interface had been reached when pipe recovery consisted of oil-cut salt water.

Total depth of the venture was 3,900 ft. and string of casing is currently being run after which production test operations will be carried out in an effort to fully determine the venture's commercial worth.

● Canadian Oil Companies, Ltd., reported oil discovery at another pair of wells in southeast Saskatchewan, both on farmout lands acquired from Canadian Superior Oil of California. The new discoveries were chalked up in the Charles sector of the Mississippian at its 9-23 Colgate and the Mission Canyon sector of the same formation at the firm's 6-17 East Roughbark, drilled in the Charles producing sector of Weyburn oil field. They are the third and fourth oil strikes in its current 12-well exploration drilling program on these farmout rights. The 9-23 Colgate well is situated 17 miles south of the town of Weyburn and 5½ miles south of the main development sector of Weyburn oil field, while the East Roughbark oil find is in the southwest corner of Weyburn field.

At the White Rose-Canadian Superior 9-23 Colgate, LSD 9, 23-5-14w2, Charles zone production was indicated when a 48-ft. interval below the 4,900-ft. level gave up 80 ft. of heavily oil-cut mud, 600 ft. of gassy oil and 360 ft. of sulfurous salt water.

The Mission Canyon zone at the White Rose-Canadian Superior 6-17 East Roughbark well on LSD 6, 17-6-13w2, flowed oil to surface when a 63-ft. interval below 4,730 ft. was drill-stem tested.

● The team of Husky Oil & Refining, Ltd., and Phillips Petroleum Co. has found oil in the Viking sand at an exploratory test in the southwestern sector of Saskatchewan, 4 miles southwest of oil production in Smiley-Dewar Viking sand oil field. During drill-stem test in the discovery horizon, 24°-gravity crude oil flowed to the surface at an estimated rate of 10 bbl. per hour, and pipe recovery was 700 ft. of gassy oil and a small amount of salt water.

This strike, Phillips-Husky 1 Cathy, on LSD 11, 17-30-26w3, lies 1¾ miles south-southwest of the same team's 1 Dewar, Detrital zone oil discovery well.

Discovery test covered a 16-ft. interval below the Viking contact which was picked at 2,358 ft. Further tests have been conducted at the wellsite, drilled as a Devonian formation venture, but operator has not released details on them.

● Gridoil Freehold Leases, Ltd., has placed its 12-26 Weyburn, Charles zone discovery well on production after rating an initial potential of 218 bbl. per day, through a restricted choke. This recent southeast Saskatchewan strike, drilled on LSD 12, 26-6-14w2, is about 3 miles west of the main development sector of Weyburn oil field, found 52 ft. of net pay zone.

The well was carried to total depth of 4,640 ft. and production casing was set 30 ft. above the bottom of the hole. A 10-ft. sector below 4,537 ft. was opened up by perforations and a small acid treatment was applied. After swabbing the well 'kicked-off' and the 218 bbl. a day rate was measured on production tests through various sized chokes.

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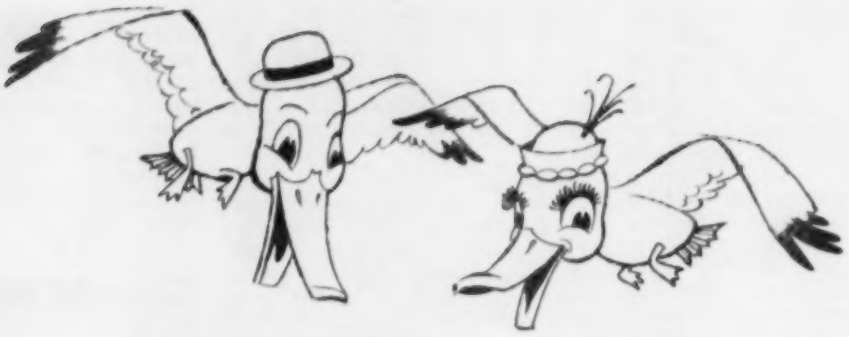

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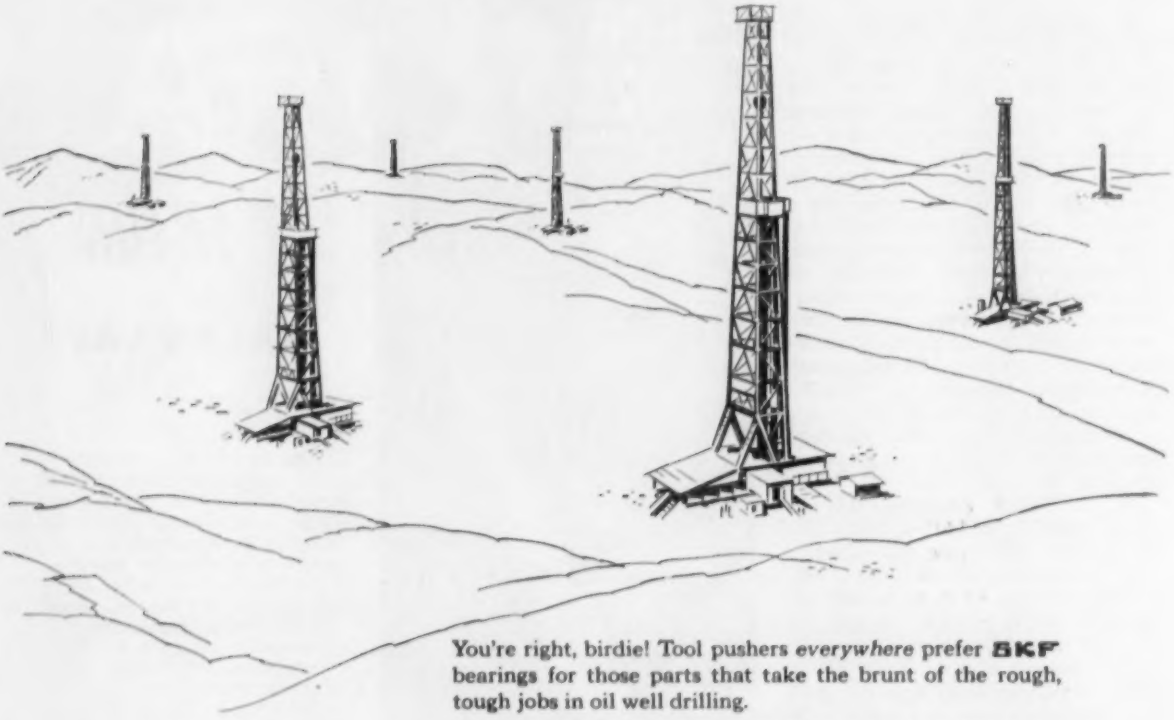

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124 BOPD, ⅛-in., 44°, perforations 6,452-54 ft. (Wilcox). TD 6,918 ft. Elev. 144 ft., Wilcox 4,501 ft., base Baker shale 6,337 ft. (New field—Laurel Hill.)

Clark County: Central Oil Co. 1 G.M.&O., 12-10n-8w. IPP 82 BOPD (net), 20.8°, 15 per cent water, perforations 4,740-46 ft. (Eutaw-Morrison). TD 4,740-46 ft. Elev. 263 ft., Selma 3,585 ft., Morrison 4,740 ft. (Extends North Yellow Creek field.)

ALBERTA

Great Plains et al 7-29 Eagle Hill, LSD 7, 29-32-3w5. TD 10,995 ft. Mississippian gas well.

TEXAS GULF COAST

Bee County: A. A. Moore 1 Curlee, Bee County School Land, A-102. Shut-in gas well, no gage, perforations 2,068-76 ft. TD 4,510 ft. (New field.)

Victoria County: Transcontinental Production Co. 1 Jackson, Elijah Stapp Sur., A-111. IP 4,250 M.c.f. daily, open-flow potential, GOR 100 M.c.f. per bbl., perforations 2,842-50 ft. TD 4,000 ft. (Discovery well—Stapp area.)

Walker County: Humble Oil & Refining Oil Co. 1 Trinity State Bank, Charles McHenry Ellis Sur., A-371. IP 7,700 M.c.f. daily, ¼-in., dry gas, perforations 2,558-68 ft. TD 4,600 ft. (New field.)

SOUTHWEST TEXAS

Bexar County: Motex Oil Co. 2-B Evans, F. L. Paschal Sur. 51, A-579. IPP 4.79 BOPD, 36°, open hole 632-40 ft. TD 640 ft. (New field.)

Hidalgo County: Shell Oil Co. 1 Boston-Texas Land Trust, Segundo Flores Sur. 27, A-83. IP 1,600 M.c.f. daily, ⅞-in., 72 BC per 1,000 M.c.f., perforations 11,174-11,218 ft. TD 11,311 ft. (New field.)

NEBRASKA

Kimball County: Petroleum, Inc. 1 Heidemann, C SE NE 23-15n-56w. IPP 120 BOPD, J sand discovery, new field. TD 6,425 ft. J sand.

NORTHWEST NEW MEXICO

San Juan County: Arizona Exploration, Inc. 1 Petro-Atlas-Bolack, S½ NW SE 9-30n-16w. IPP 28 BOPD, Mancos shale discovery, new field. TD 1,300 ft. Mancos.

WYOMING

Natrona County: H. O. Batzer 1 Government, C SW NE 20-31n-82w. IP 1,275 M.c.f. of gas per day, Stray sand of Steele discovery, new field. TD 2,006 ft.

LOUISIANA GULF COAST

Allen Parish: Serio-Punches Oil Co. 1 Bel Lumber, 29-6s-7w. IP 132.48 BOPD, 5/32-in., 49°, GOR 1,622 cu. ft. per barrel, perfs 10,065-70 ft. (lower Frio). TD 10,305 ft. (Revives and extends old Bel area.)

Plaquemines Parish: Humble Oil & Refining Co. 1 State Lease 1067, Blk. 25, West Delta Area, Gulf of Mexico. IP 154.7 BOPD, ⅛-in., 25°, GOR 383 cu. ft. per barrel, perfs. 8,295-8,305 ft. TD 12,863 ft. (New offshore field.)

St. Landry Parish: California Co. 1 Young, 18-6s-2e. IP 36 BCPD and 1,676 M.c.f. daily, 5/32-in., 62.3°, perfs. 8,350-56 ft. TD 11,502 ft. (Extends Savoy field 2 miles north—new pay.)

St. Martin Parish: Howell, Holloway & Howell 1 Iberville, 118-7s-8e. Shut-in gas well, no gage, perfs. 10,517-45 ft. TD 11,014 ft. (New field or extension—1½ miles SE of Happytown field.)

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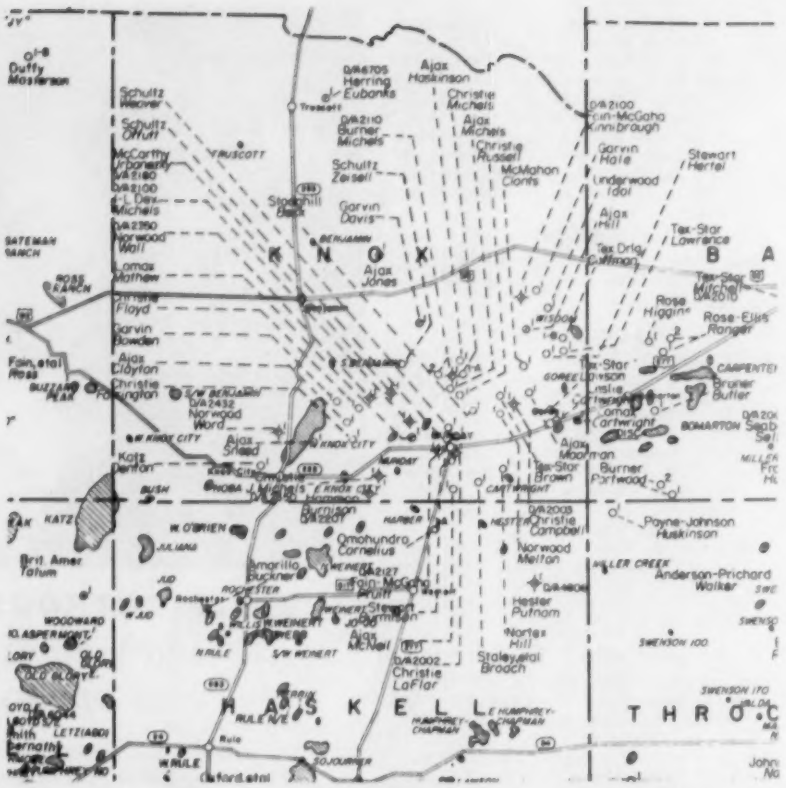
WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, N. J.

The Sound and the Fury in

Knox County

by Carl Hoot
District Editor



Sudden spurt of drilling in Knox County is shown in portion of West Central and North Texas wildcat map. Circles are wildcat locations. Courtesy Midland Map Co.

THE accompanying portion of a North Texas wildcat map shows what has, and is happening to Knox County, North Texas, and where shallow drilling is bringing in good producers.

Southern Knox County is geologically within the Baylor basin, an area on which little has been written. It has come into prominence over the past few months when a number of operators, mostly small, plus one or two majors, found good-looking "hickies" showing a possible 80 to 160 acres each, and proceeded to drill them up with outstanding success.

Shallow pay objective . . . Objective of the current play is the Tannehill sand, usually found above 2,000 ft. The Tannehill is a member of the Wichita Group, of Lower Permian geological age. Operators say there are three producing sections, labeling them the Upper, Middle and Lower.

Potentials and allowables . . . Completion potentials vary widely, but the lowest reported to this writing was 24 bbl. a day. Texas Drilling Co., Wichita Falls, has completed nine wells on its Buster Coffman lease, just southeast of the town of Goree, with initial potentials ranging from 100 to 300 bbl. a day. Daily allowable on these wells, in the 1,750-ft. depth class, is 36 bbl. Gravity of the oil runs from 30°-40°.

No drilling problems . . . So far there have been no drilling problems. Texas Drilling Co. uses a 3,000-ft. capacity portable rotary rig, and finishes its wells in from 4 to 5 days total time. Other operators report drilling time averaging 30 hours.

Wells are drilled to 1,600 ft. with clear water, then a "few" sacks of mud are added to prevent lost circulation, according to Texas Drilling. The casing program varies with the area. A recent discovery southeast of Munday set 10¾-in. pipe to 62 ft., 4½-in. to 1,874 ft., and 2-in. to 1,800 ft. To complete, perforating shots were placed betweeen 1,808-23 ft. In other wells, 8¼-in. and even 7-in. casing is used for conductor pipe.

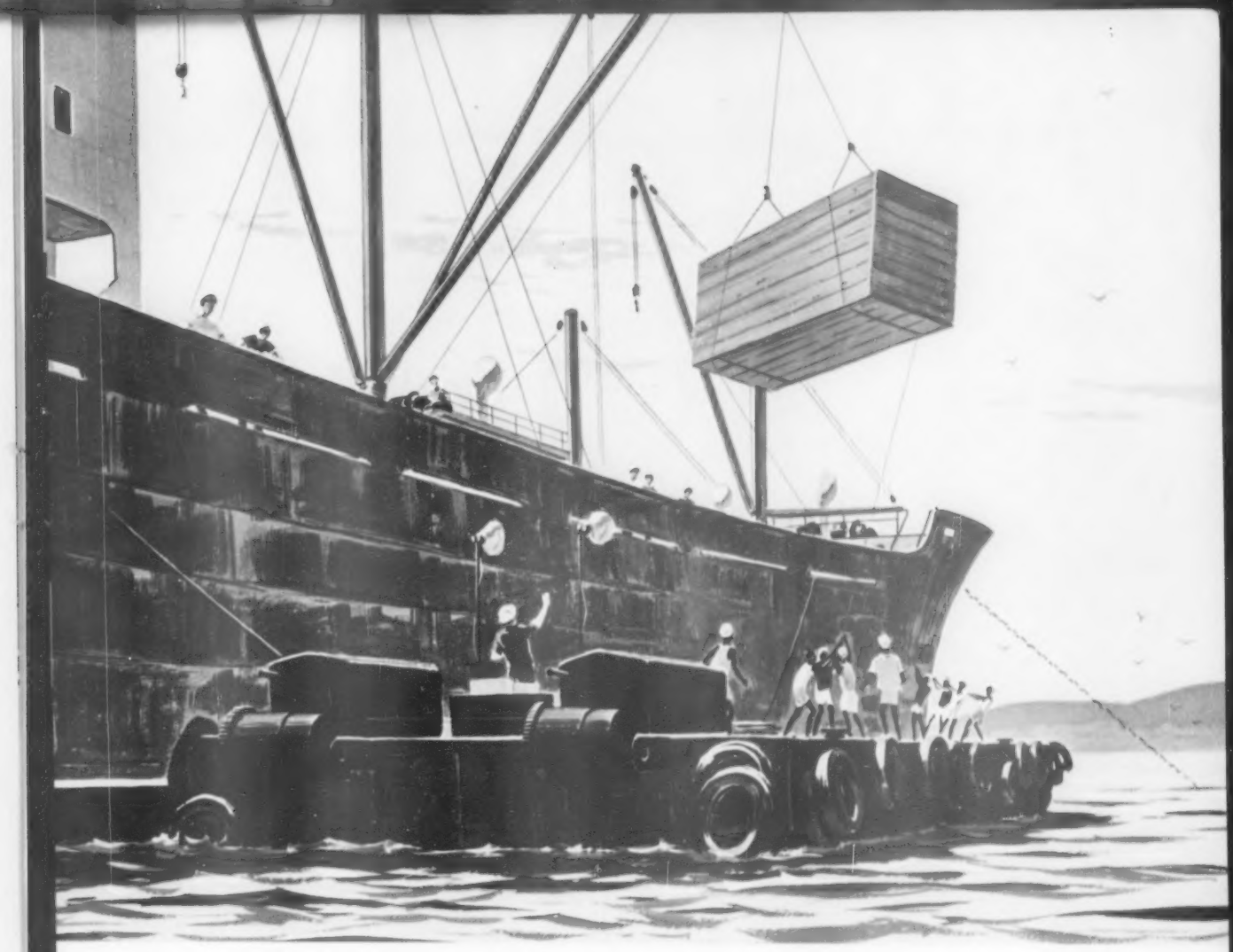
Shell Oil Co. has completed six wells on Buster Coffman lands, in the same area with Texas Drilling. All of Shell's wells are within ½ mile of Goree; tops of pay formation ranged from 1,712-56 ft. and potentials ranged from 58-237 bbl. daily.

On the success side, one partnership, H. S. Rose and Burton E. Ellis, operating out of Holliday, completed 21 wells out of 21 tries. Pay was found at depths from 1,646-1,700 ft., and potentials ranged from 24-97 bbl. a day. All of these producers were drilled on the Joe Maloney lease, 2 miles south of Goree.

McMahon-Bullington Drilling Co. completed its 1 Johnson as a discovery 2 miles northwest of Munday. The well produced 142 bbl. of oil a day through 18/64-in. choke, from pay topped at 1,949 ft. Throckmorton Oil Co. 1 City of Goree, located ½ mile east of Goree, found pay at 1,719 ft. and completed on the pump for 111 bbl. a day.

Dry holes too . . . While the success ratio is high, there also have been dry holes. Johnson & Newman, Plainview, drilled seven wells on the Bates lease 3 miles northeast of Goree. Four of these were dry and three were producers, with potentials from 21-43 bbl. a day. Pay ranged around 1,659-73 ft.

Outlook . . . Operators are confident the area, which extends into Baylor County on the east, King County to the west, and Haskell County on the south, will provide additional seismograph hickies for future drilling. What to do with the oil is another picture, due to lack of pipeline space. There is some trucking of new oil, but most of it is collected by Toronto Pipe Line Co. for transportation to refining points by Shell Pipe Line Co. In the meantime, however, new starts are running at the rate of six a day in Knox County.



WANTED: an oil town in 69 days

Last January 15, a customer came to us with a problem. They wanted to start drilling in an East African area before the monsoons began in early May. They would have to land men and equipment from a ship anchored offshore, build miles of road to the drilling site, set up living quarters for 26 men, and finally make the entire "town" self-sufficient for at least six months. Our job: provide the major portion of the material needed and assume full responsibility for delivery by April.

We built the rig and accessory equipment, manufactured 5 miles of drill pipe and a great miscellany of spare parts. In addition, we found, bought and delivered to the dock 19 air-conditioned trailers, including one fitted as a refrigerator and filled with three tons of meat. Also an electric generating station. Also 720 pounds of coffee and a supply of vegetable seeds. Also a bulldozer for road building. Also two metal warehouses. Also trucks, ice cream freezers, jackhammers, medicine, toasters and brooms. The ship sailed with the 4000-ton order complete on March 23, just 69 days after the order was placed. Drilling activities began on schedule.

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These National Rotaries put new speed in

There are a host of good reasons why you see so many National Rotaries on operating rigs today. Contractors tell us these machines are rugged, safe and really durable in service. They also report a consistently high level of performance on every kind of drilling job . . . faster round trips . . . far less downtime.

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The careful balance of design, engineering and manufacturing standards in National Rotaries provides you with these important operating benefits:

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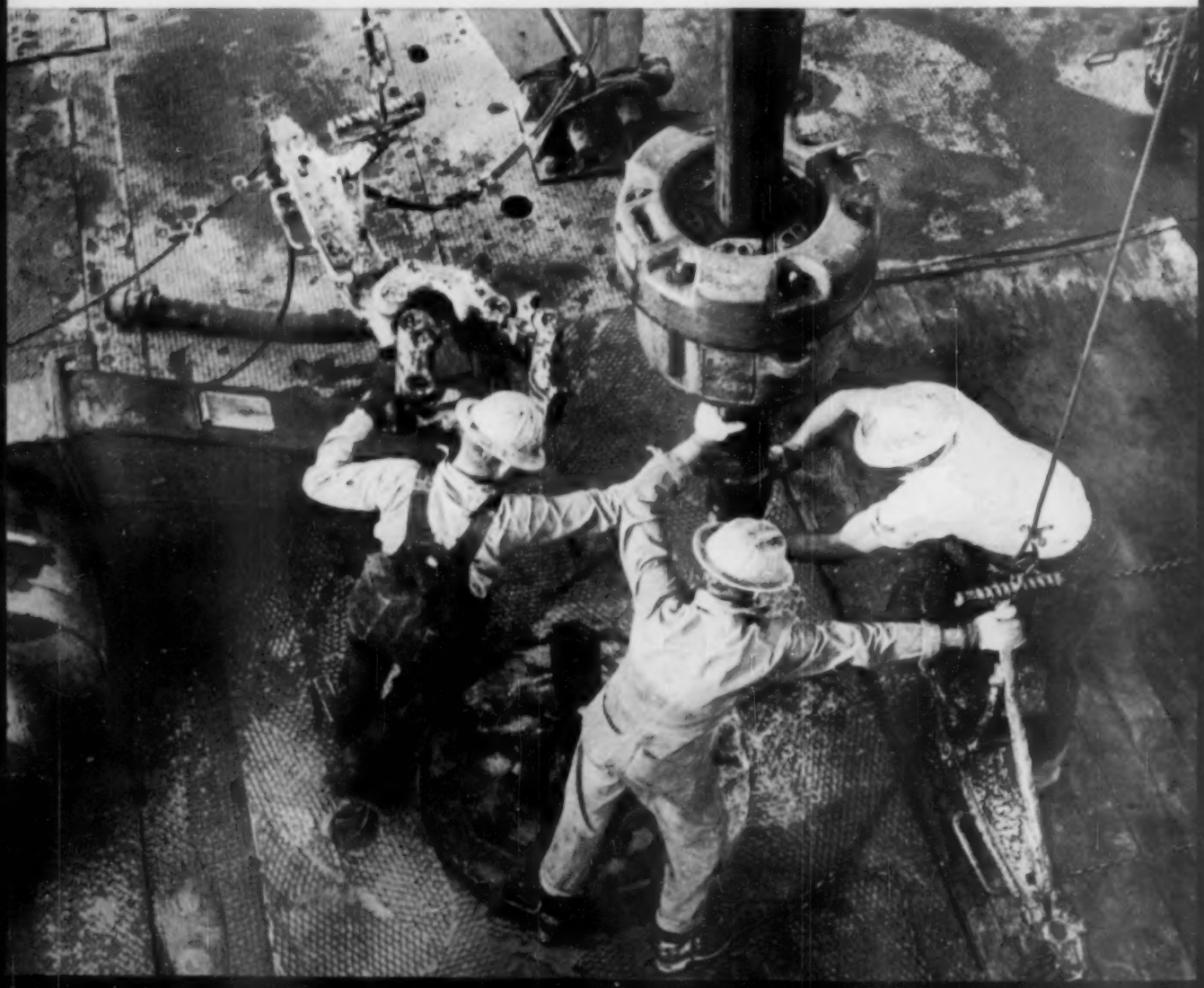
Easy servicing—because of improved pinion shaft assemblies which are mounted in individual housings on the under sides of the base.

Dirt-free bearings—due to special mud and oil seals which prevent entrance of mud—or escape of oil.

Ample lubrication—insured for all main bearings and gears through a continuous action system induced by table rotation.

Of course, there's a National Rotary to suit your every drilling need. Check the models shown here, including the famous Ideal Multimatic Rotary. Then ask the National Supply Representative in your area about them soon.

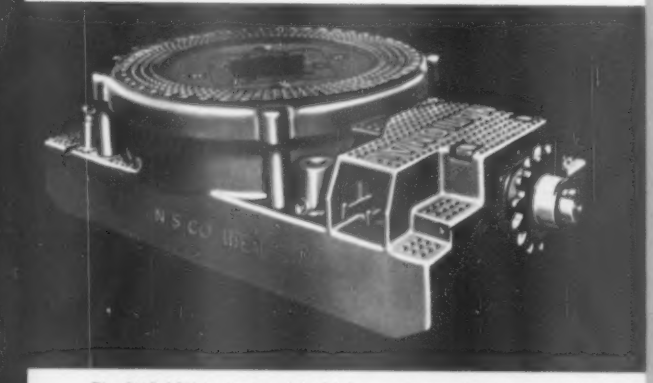


drill string round trips and casing jobs!

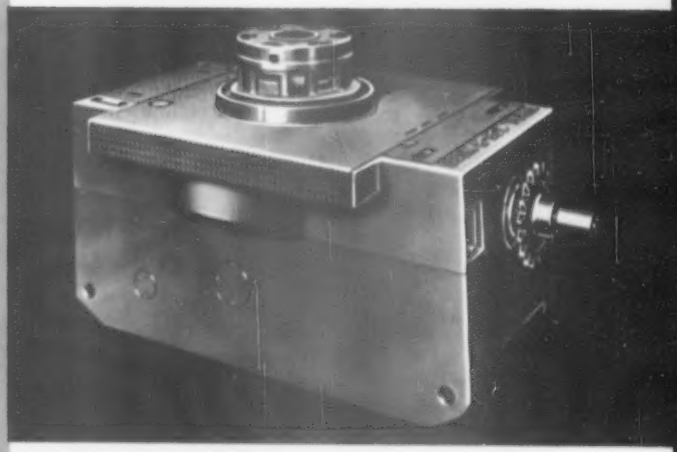
Which IDEAL* Rotary can you use to reduce drilling costs?

The FE-12½ is a lightweight machine for shallow drilling at average speeds. Made with either 36" or 44" spacing between sprocket and table center, it can be used either on narrow width and portable rig hook-ups or on standard derrick installations.

The MS-27½ is built for deep drilling at medium to high speeds. It offers a 27½" table opening and has a standard spacing of 53¼". A similar model, the MS-20½, differs only in table opening.



The SHS-20½ is designed for high speed operation in deep drilling. It differs from the MS-20½ in that it is built for heavier duty service.



The 205-B MULTIMATIC is built for high speed drilling at any depth, and combines in one unit a modern rotary; built-in, air-actuated, long slip-operating mechanism for drill pipe and casing; a new direct-drive kelly bushing; and the equivalent of an automatic casing spider.

The SA-175 is the first of a new line of National Rotaries. Developed with a 44" spacing, it features a rectangular design for easy installation, a cartridge type pinion shaft assembly, a unitized table and bearing assembly, exclusive oil bath lubrication and an improved meter bushing.

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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

ON THE NEXT PAGE—TWO MORE NATIONAL PRODUCTS FOR FASTER DRILLING

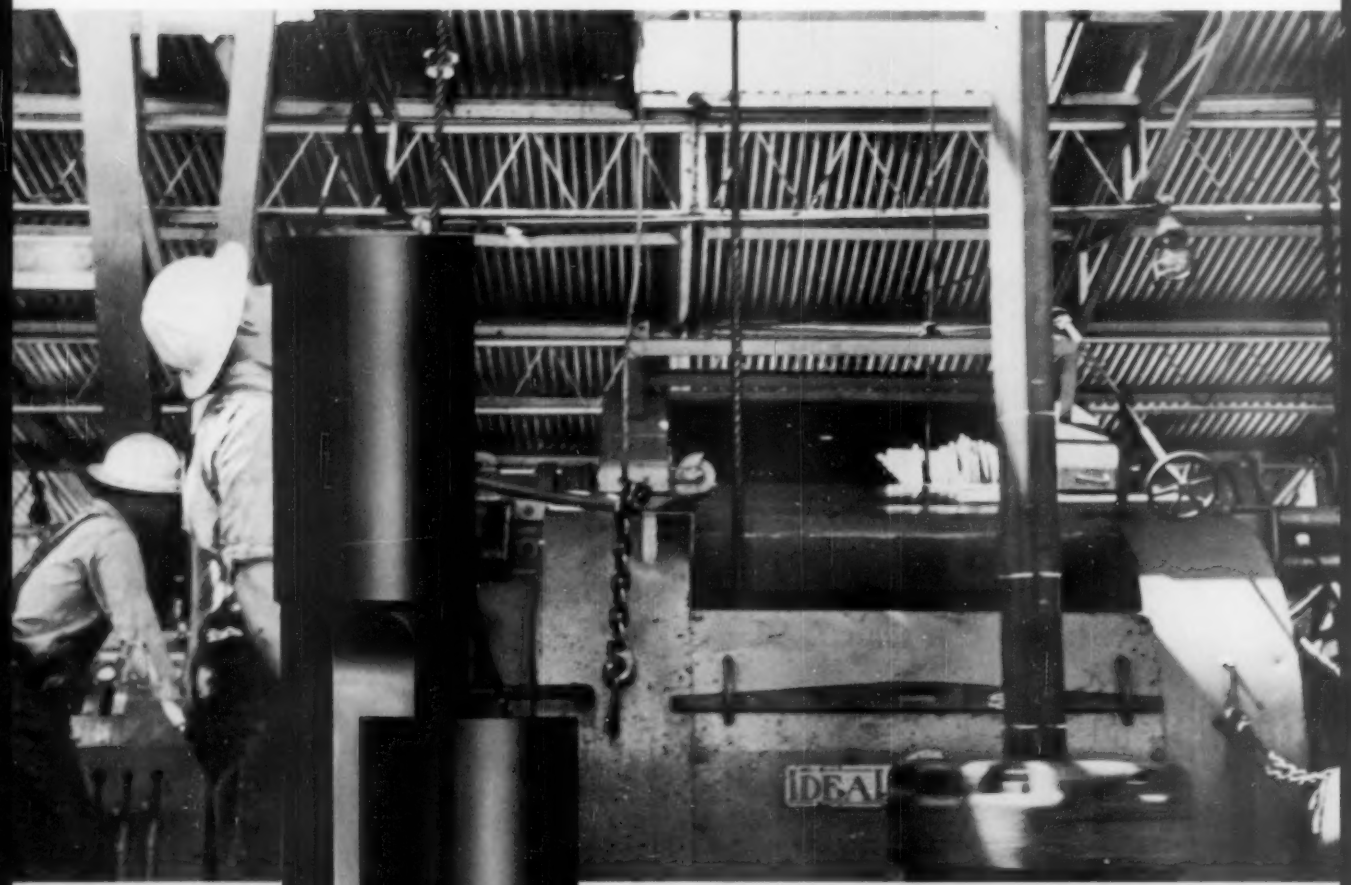
Precision National Kellys and Collars extend drill string life!

Here's why National Kelly and Collars promote maximum penetration rates at all drilling speeds and help reduce drill pipe failures:

NATIONAL KELLYS, in both square and hexagonal types, are precision-manufactured of Ideal Electric Steel and accurately bored for true concentricity. In use, they provide smoother "feed-off" and the true balance necessary for long drill string life and trouble-free operation.

NATIONAL COLLARS, with stress relief grooving in both box and pin, provide maximum fatigue resistance in drill collar joints. Tempered for high strength, accurately bored and precision threaded, National Collars have an outstanding reputation for extreme durability and long-range economy.

Both National Kellys and Collars are readily available in all standard A.P.I. joint sizes. See your National representative soon about the types and sizes to meet your needs!



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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

Eastman's rule for success:

. . . Become Expert on One Area

RESERVE OIL & GAS CO. recently spudded another well in a long series of tests exploring and developing its big Tejon Ranch lease in Kern County, California. There was only one thing unusual: Max Eastman wasn't there.

Until recently Eastman always was a fixture at the spudding-in operations or completion of important Reserve discoveries. He had been Reserve's vice president for production since October, 1951, and had spent most of his life in the San Joaquin Valley oil country.

Eastman moved into the company's head office in San Francisco last July as executive vice president. He still is helping map the company's active drilling program. But his link with the field is mostly by telephone and teletype.

Sticks with area . . . Eastman brought to his new job a thorough knowledge of the San Joaquin and its underground structure.

Like the Reserve management as a whole, Eastman is a firm believer in sticking with a promising area until every available shred of information about it has been obtained, assembled, and utilized.

Eastman was reared and educated at Taft in the heart of the California oil country. He received a petroleum engineering degree in 1939 from the University of California, Berkeley. A thesis on a core analysis won him his first job on graduation—a 6-month stint at General Petroleum's research laboratory at Vernon, Calif.

Eastman returned to familiar surroundings on his next job. He worked as an employe of the Navy in evaluating Standard Oil of California's holdings in the Elk Hills Naval Reserve.

Big job for Navy . . . Eastman entered the Navy in May 1942 as an ensign assigned to duty, naturally enough, as a petroleum engineer on the Elk Hills project.

The Elk Hills field is called into production almost solely during wartime as a source of vital oil needs for the fighting forces. So when the oil-shortage crisis broke in the U.S. right after Pearl Harbor and Congress asked for 65,000 bbl. daily from Elk Hills, Eastman was already on the job. He continued working at Elk Hills during the monumental task of developing and producing the field for the war effort.

At the end of the war, Eastman got out of uniform but stayed on at Elk Hills. He was named by the Secretary of the Navy as the Navy's civilian

MAX EASTMAN
. . . the man behind Reserve's production

member of the two-man operating committee to run the Elk Hills operation. He served in this capacity until 1951.

Having lived and worked in the Kern County oil fields for so long, Eastman naturally was acquainted with the Tejon Ranch territory south of Bakersfield, and with Reserve, whose first few wells in the area had just started producing.

"I chose Reserve as a probable growth company because of its large land holdings at Tejon," says Eastman. "And because of the aggressive activities of the company under the able management of Jasper W. Tully."

"But in those days," Eastman adds with a laugh, "the area was just starting to overcome a bad reputation—it had been known as a graveyard for wildcatters."

What Eastman, Tully, and the rest of the Reserve team have done with the Tejon "graveyard" is a matter of record—and an impressive record it is.

Major strikes . . . A series of major oil discoveries was made, the most important of them being the Valv zone in 1951 and the Olcese and JV zones, both in 1954.

As vice president in charge of production, Eastman supervised the exploratory work and research that brought the field into heavy production. He became a director of the company in May 1955.

In 1956, Reserve went offshore to engage in a joint venture with Signal Oil & Gas Co. and Artnell Oil & Gas Co. in the exploration of the tidelands of Redondo Beach, Calif. This operation is following, with Signal as operator, the kind of careful procedure that Reserve concentrated on at Tejon. A series of wells, all producers so far, is being drilled under the ocean from the shore, so possible development from offshore will have maximum information available.

Since transferring his headquarters to San Francisco, Eastman has settled into a home in suburban San Anselmo with his wife, Bertine, and their three children: Chuck, 16; John, 13; and Donna, 9. His avocations include deep-sea fishing, golf, out-door barbecuing, and morning swims before going to work.

S. N. Helmuth, geologist for Standard Oil Co. of California in Bakersfield, Calif., has been named development geologist in Taft, Calif.

B. David Meltzer, petroleum engineer with The California Co., has been transferred to Natchez, Miss., from Cranfield, Miss.

Gerald B. Bennett, assistant Southwest division gas superintendent for Sun Oil Co., has been appointed acting division superintendent. **Robert L. Sullivan,** special assistant, has been named acting assistant division superintendent. Bennett succeeds **Benton E. Warren,** who has moved into Sun's foreign operations as Latin American division manager.

J. B. Hunt, production foreman in Stanolind Oil & Gas Co.'s Canadian division, Pembina area, has been promoted to field superintendent in the Edmonton area. **M. W. Leenhouts** has been named district geophysicist in Stanolind's Calgary district. Hunt has been with Stanolind since 1933. Leenhouts joined the company in 1947.

Harold E. Vaughan, of Continental Oil Co., superintendent of natural gasoline and gas operations for C.A.T.C. marine region, has joined Transcontinental Gas Pipe Line Corp. in Houston as assistant to the vice president for gas supply. A graduate of Louisiana State University, Vaughan had been with Continental Oil Co. for 17 years. He was assistant southern region superintendent of natural gasoline and gas operations before going to C.A.T.C.'s marine region.

Personals

Cecil M. Keller, chairman of the exploration committee and central division landman for Tidewater Oil Co. in Tulsa, has resigned to become an independent there.

S. R. Evans, formerly with D. D. Feldman Oil & Gas in Corpus Christi, Tex., has opened geological consultant offices in Tulsa. Evans was with Sunray Mid-Continent Oil Co. before joining D. D. Feldman.

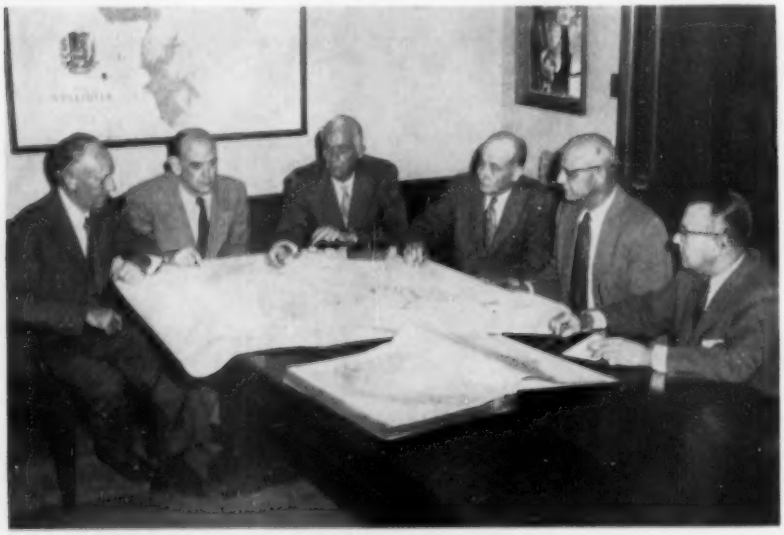
Dr. Charles H. Riesz has been promoted to senior scientist at Armour Research Foundation of Illinois Institute of Technology, Chicago. Riesz has been with the foundation since 1952. He was formerly with the Institute of Gas Technology, Universal Oil Products Co., Gulf Research & Development Co., and Sinclair Refining Co.

Robert J. Minton of American Petrofina, Inc., has been elected president of the Intermountain Association of Petroleum Geologists, Salt Lake City. Other officers are **James C. Goodwin,** first vice president, Standard Oil Co. of California; **George Herman,** second vice president, Shell Oil Co.; **John N. Dahm,** secretary, El Paso Natural Gas Co.; and **Floyd H. Hoffman,** treasurer, The Texas Co.

W. V. Dean, Jr., petroleum engineer with The Texas Co., has been transferred to the company's Bellaire, Tex., research laboratory from New Orleans.

C. G. KIRKBRIDE

Chalmer G. Kirkbride, president and chairman of the board of Houdry Process Corp. since 1952, has resigned to become executive director of Sun Oil Co.'s research, patent, and engineering departments. Kirkbride was with Standard Oil Co. (Ind.), Pan American Refining Corp., and Magnolia Petroleum Co. before joining Houdry. **Dr. Charles L. Thomas,** associate director of Sun's research and development department, has been appointed director. Thomas joined Sun in 1951. He was previously with Universal Oil Products Co. and Great Lakes Carbon Corp. Thomas succeeds **Dr. J. Bennett Hill,** who has retired. A pioneer oil industry chemist, Hill joined Sun in 1954. He had directed oil research for Atlantic Refining Co. before joining Sun. In 1950, Hill received a Certificate of Appreciation from the American Petroleum Institute, the first award given by A.P.I. in recognition of research activity. **T. A. Burtis,** associate manager of research and development, will succeed Kirkbride as president of Houdry.



Sun Department Plots Course

Sun Oil Co.'s newly organized foreign operations department huddles with J. G. Pew, third from left, Sun's vice president in charge of production. From left to right are: Paul W. McFarland, Dallas, manager of geology and geophysics, Latin American division; Ted C. Stauffer, Philadelphia, director of foreign operations; Pew; B. E. Warren, Dallas, manager of the Latin American division; Herbert J. Weeks, Philadelphia, geological counselor for foreign operations; Winfield Givens, Philadelphia, foreign representative and manager of Sun's land department.

Jack O. McCall has been elected a vice president of Louisiana Land & Exploration Co.

G. W. Cottrell, production engineer with Pure Oil Co. in Olney, Ill., has joined Helmerich & Payne, Inc., in Tulsa in the same capacity.

Leland S. Lovell, assistant chief oil dispatcher for Buckeye Pipe Line Co. at Lima, Ohio, has been named chief oil dispatcher. He succeeds the late Paul E. Williams.

J. D. Behling, planning engineer for Service Pipe Line Co. in Tulsa, has been appointed assistant supervisor of oil movements. **E. B. Johnson,** cost engineer, will succeed Behling. **Frank O. McCullough,** engineer in the company's planning section, will replace Johnson as cost engineer.

Walter M. Wilkinson, Midland, Tex., petroleum consultant, has formed a new firm, Wilkinson Drilling, Inc., in Wichita, Kans. Wilkinson was with Hanley Co. in Midland before opening consulting offices. Before joining Hanley he was division geologist for Sohio Petroleum Co. in Oklahoma City.

Dr. Sherman S. Shaffer, staff associate in Humble Oil & Refining Co.'s technical and research divisions, Baytown, Tex., has been elected chairman of the American Chemical Society's Division of Petroleum Chemistry. He succeeds **Dr. Alex G. Oblad,** manager of research and development for Houdry Process Corp., Marcus Hook, Pa. Other officers are **Harold M. Smith,** chairman-elect, assistant supervising engineer, U.S. Bureau of Mines, Bartlesville, Okla.; and **Wheeler G. Lovell,** secretary-treasurer, director of automotive products development, Ethyl Corp., Detroit.

Jack F. Gale, contract representative for Transcontinental Gas Pipe Line Corp. in Houston, has been promoted to supervisor of gas purchases. **N. W. Lassiter, Jr.,** senior engineer, compressor stations department, Houston, has been appointed division superintendent in the department. **Leonard F. Cowling,** superintendent of the company's Linden, Ala., station, has been transferred to Atlanta, Ga., as division superintendent of compressor stations division. **Lawrence P. Seaton, Jr.,** will succeed Cowling at Linden. **Walter H. Buckingham,** superintendent of the company's Ellicott City, Md., station, has been transferred to the Houston compressor department as senior engineer. He will be succeeded at Ellicott City by **Frank M. Hamilton.**

H. T. Griffin, gas and mechanical engineer for Gulf Oil Corp. in Tulsa, has been transferred to Denver.

Charles M. Cole, petroleum engineer with Aztec Oil & Gas Co. in Hobbs, N.M., has joined El Paso Natural Gas Co. in Jal, N.M., in the same capacity.

Thurman L. Jones, district geophysicist for Atlantic Refining Co., has been transferred from Lake Charles, La., to Lafayette, La.

James G. Couch has been appointed manager of the engineering section, production department, for U. S. Industrial Chemicals Co. He will supervise plant design, construction, and modification for U.S.I. and its subsidiary, National Petro-Chemicals Corp. A graduate of the University of West Virginia, Couch has been with U.S.I. since 1953.

George I. Lewis, formerly on special assignment for Shell Oil Co. in The Hague, Netherlands, and New York, has been appointed Calgary division manager for the company. He succeeds **L. A. Lewis,** who has been transferred to the company's New York office. G. I. Lewis joined Shell in 1949. He was previously with Burmah Oil Co. in Burma and India.

Dr. Alan S. Horowitz, research geologist, and **Dr. Peter R. Taussig,** research chemist, have joined the staff of Ohio Oil Co.'s Denver research center. Horowitz attended Washington and Lee University, Ohio State University, and the University of Indiana. Taussig attended Antioch College and received his Ph.D. from Cornell University.

J. L. Miller, superintendent of operations at Shell Oil Co.'s Houston refinery, has been appointed manager of the Montreal East refinery of Shell Oil Co. of Canada, Ltd. Miller has been with Shell since 1920. He has held his present position in Houston since 1937 and was superintendent of the company's East Chicago refinery before that time.

C. K. Smith, Tulsa, has been promoted from general superintendent to vice president in charge of drilling and production for Toklan Oil Corp. **E. P. Neal,** manager of the exploration department, has also been appointed a vice president of the firm.

Paul D. Sweitzer, drilling foreman for The Texas Co. in Pampa, Tex., has been transferred to Abilene, Tex., in the same capacity.

Raymond P. Sanders, Jr., has opened offices in Houston as consulting petroleum engineer. He was formerly production superintendent for **M. E. Andrews,** Houston independent.

James E. Beck, assistant superintendent at Northern Natural Gas Co.'s Hobbs, N. M., compressor station and gasoline plant, has been named process engineer in the compressor department in Omaha, Neb.

J. D. Dewhurst has been named exploration manager of Pakistan Petroleum, Ltd. Dewhurst, a senior member of Burmah Oil Co.'s geological staff, was previously senior geologist for Pakistan Petroleum. He succeeds **E. V. Corps** as exploration manager.

L. H. Betow, resident chemist at Continental Oil Co.'s Lake Charles, La., refinery, has been promoted to assistant to **Harold G. Osborn,** a senior vice president of Continental, and transferred to Houston. Betow has been with Conoco since 1944.

Dr. Ralph L. Cheesman, a senior geologist with the Saskatchewan Department of Mineral Resources, has been appointed principal geologist (Pre-Cambrian). He succeeds **Dr. A. J. Budding,** who has accepted a teaching position with the New Mexico Institute of Mining and Technology. Cheesman has been with the department since 1955.

Tom Allan, Wichita independent, has been elected president of Kansas Oil and Gas Association. **E. B. Shawver,** Wichita independent, was reelected vice president for life, an annual honor for Shawver who founded the organization in 1939. Other officers are **Glenn Dunne, Jr.,** vice president for Sedgwick County, Dunne Brothers Drilling Co., Wichita; **Ed Morris,** vice president for East Central Kansas, Rex Morris Drilling Co., El Dorado; **Carl Wiener,** vice president for Eastern Kansas, Chanute independent; **Paul Ward,** vice president for Northwest Kansas, president, Producers Pipeline & Gas Co., Hayes; **Joe Honaker,** vice president for Western Kansas, Honaker Drilling Co., Great Bend; **J. C. Lemon,** vice president, Southwestern Kansas, Pratt independent; **Kenny Rupp,** secretary, Rupp-Ferguson Oil Co., Wichita; **Hiram Lewis, Jr.,** treasurer, Lewis Drilling Co., Wichita; and **Tom Orr,** executive secretary.

Personals

Walter Cassida, geologist for Continental Oil Co., has been transferred to Denver from Ponca City, Okla.

W. A. Ryan, area supervisor of terminals for Great Lakes Pipe Line Co., has been appointed general superintendent of the company. Ryan has been with Great Lakes since 1935. During World War II, he helped construct and operate one of the first foreign pipelines built under wartime conditions.

Walter H. Strong, resident vice president and general manager for Southern Production Co., Inc., in Canada, has announced plans to open independent operating and consulting offices in Canada.

R. K. Turner, vice president of Bakelite Co., has been named vice president of Carbide & Carbon Chemicals Co. Both companies are divisions of Union Carbide & Carbon Corp. Turner joined Union Carbide in 1924. He has been vice president in charge of production for Bakelite since 1952.

Paul G. Blazer, chairman of the board of Ashland Oil & Refining Co., has resigned after 33 years as head of the firm and its predecessors. Blazer will remain as chairman of the executive and finance committees of the company. A new board chairman will be elected at the January stockholders meeting. Blazer has indicated he will recommend that **Rexford Blazer,** president of the company, be named chairman, and that **Everett F. Wells,** executive vice president, be named president.

E. A. Malick, manager of Phillips Petroleum Co.'s rocket fuels division of the research and development department, has been transferred from McGregor, Tex., to Bartlesville, Okla., where the division will make its new headquarters. Also involved in the transferred are **J. A. McBride,** manager of technical planning for the rocket fuels division; **J. M. Donohoe,** manager of facilities planning; and **W. R. Davison,** manager of program analysis. **I. L. Coffman,** manager of the engineering and utility services branch of the McGregor plant, has been promoted to plant manager for the rocket fuels division there.

Personals

B. P. Nixon has been named production engineer for Lone Star Producing Co. in Athens, Tex. Nixon recently returned from service with the U.S. Army.

Bryant Head, district production superintendent for Monterey Oil Co. in Midland, Tex., has resigned to join W. E. Bakke Oil Co. in Midland as production superintendent. Head was with Navarro Oil Co. before joining Monterey.

A. J. Ferguson, assistant manager of Esso Standard Oil Co.'s crude oil purchasing department, Shreveport, La., has been promoted to manager. He succeeds **C. H. Whitman,** who has retired. Ferguson joined Esso in 1938. He has been assistant manager of crude oil purchasing since last year and was head of the technical division before that time.

Robert B. Harkins has been named assistant to the vice president of Panhandle Eastern Pipe Line Co. in Kansas City. **George B. McClellan** has been appointed manager of the newly created production and supply division in Liberal, Kans., and **Francis J. McElhatton** will be general manager of the gathering and transmission division, Kansas City. **Evan A. Thomas** will be director of the office of resource planning in Liberal. In Kansas City, **William C. Marris** has been named director of the office of operational planning and budgeting; **Herbert H. Duff,** director of the office of industrial relations; and **Lester A. Mussman,** director of the office of purchasing and stores. In the company's production and supply division, **Clifford R. Horn,** assistant to the general manager, has been named head of proration and reservoir engineering activities. **Paul L. Davis** will be manager of land and leasing; **James K. Curry,** manager of geology; **Richard C. Dixon,** manager of gas purchases; **Lex W. Phillips,** assistant manager of oil drilling; and **Samuel H. Neithercoat,** assistant manager of gas drilling. In the gathering and transmission division, the following appointments have been made: **Ernest O. Nelson,** assistant general manager; **Jack N. White,** superintendent of pipeline; **Kenneth E. Kalen,** superintendent of compressor; **Timothy J. Kirkpatrick,** superintendent of gas measurement; **Cecil VanGundy,** superintendent of pressure control; **Stephen A. Bergman,** chief engineer; **James A. Fowler,** manager of communications; and **Glenn L. Bowman,** manager of transportation.

Joseph T. Arrigo has joined the staff of Universal Oil Products Co. Arrigo recently completed work on his Ph.D. degree at Northwestern University.

Dr. Enrique T. Mauri, exploration manager for Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.) in Bolivia, has opened consulting offices in La Paz, Bolivia. Mauri joined Y.P.F.B. in 1952 as chief geologist. He was previously with Yacimientos Petroliferos Fiscales in Argentina as chief geologist of the northern district.

A. J. Flynn, gas engineer in Elk City, Okla., for Shell Oil Co., has been transferred to the company's New York offices.

R. P. Barry, Jr., assistant superintendent of the Seadrift, Tex., chemicals and plastics resins plant of Carbide & Carbon Chemicals Co., has been appointed superintendent. Carbide & Carbon Chemicals is a division of Union Carbide & Carbon Corp. Barry replaces **Dr. C. M. Blair,** who has been transferred to the company's New York offices.

Edward P. Parry, assistant professor of chemistry at State College of Washington, has joined Union Oil Co. as research chemist at the company's Brea, Calif., research center.

Guy C. Burton, district geologist for El Paso Natural Gas Co., has been appointed acting manager of the company's new Amarillo, Tex., district office. **Stewart Beven** will be geologist in the new office; **Mondel Barnes,** scout; and **Bill Musick,** landman.

Donald E. Doud, production engineer for Union Producing Co. in Shreveport, La., has been named drilling and production superintendent in Pettus, Tex.

W. F. Matheny, vice president and general manager of Sid Richardson Gasoline Co. and Sid Richardson Carbon Co. in Fort Worth, has resigned to become an independent there.

H. E. Hughes, plant superintendent for Shell Chemical Corp.'s Houston plant, has been transferred to the company's Denver plant as plant manager. **J. W. Hyde,** assistant superintendent, operations, at Houston, will succeed Hughes as plant superintendent there. **D. N. Rindsberg,** assistant superintendent, technical, will replace Hyde as assistant superintendent, operations.

DEATHS

E. J. Thomas, process engineer with Gulf Oil Corp., Pittsburgh, was killed November 27 in the crash of a Venezuelan airliner near the Caracas airport. Thomas was on a business trip to Venezuela.

Paul E. Williams, 60, chief oil dispatcher for Buckeye Pipe Line Co. at Lima, Ohio, died November 11 after a heart attack. Williams has been with Buckeye for over 30 years. He had been in the Lima dispatching office since 1934.

James Albert Dowler, 80, retired Cities Service Gas Co. superintendent of gas operations in Kansas and Oklahoma, died November 24 in Bartlesville, Okla. Dowler joined Cities Service Gas in 1926. He retired in 1946.

Dallas E. Legan, division production manager in Houston for Tidewater Oil Co., died November 25 in Chicago. He entered a hospital there after a heart attack suffered while he was attending the American Petroleum Institute meeting. Legan had been in the oil business for 50 years, beginning as a roustabout in Indian Territory.

Reginald H. Eagles, 61, vice president of industrial products department of J. M. Huber Corp., died November 14 while en route to Akron, Ohio, on business. Eagles has been with the Huber Corp. since 1923.

Edward V. Casey, 65, owner of Pure Penn Oil Co., McClintockville, Pa., died November 19 in Oil City, Pa.

William F. St. Clair, 85, retired Cities Service Oil Co., field superintendent, died November 21 in Tulsa. St. Clair was active in fields near Okmulgee, Drumright, and Seminole, Okla., before his retirement in 1939.

Roscoe W. Stephens, 79, retired director and president of St. Helen's Petroleum Corp., died recently in Los Angeles. Stephens retired in 1954.

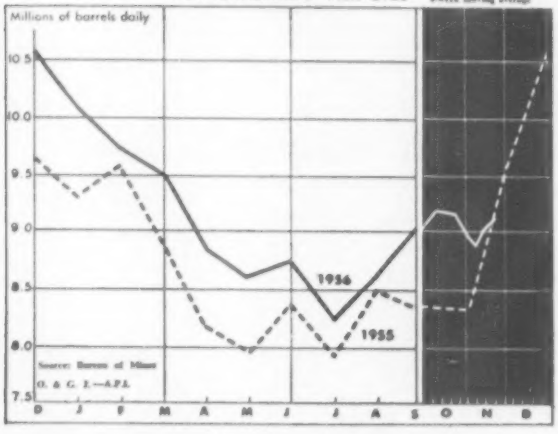
Edward A. Skinner, 64, vice president of Bahrain Petroleum Co., Ltd., died November 23 in New York. Skinner was a pioneer in Persian Gulf oil discoveries. He had been vice president of Bahrain since 1949. He returned from the Middle East 2 months ago.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,174,300	UP	14,700	UP	129,333
Crude stocks	280,221,000	DOWN	1,682,000	UP	24,682,000
Completions	1,038	DOWN	31	DOWN	68
Refinery runs	8,111,000	UP	146,000	UP	370,000
Gasoline stocks	174,544,000	UP	1,805,000	UP	18,678,000
Kerosine stocks	36,305,000	UP	327,000	UP	1,990,000
Distillate stocks	158,871,000	DOWN	1,589,000	UP	13,497,000
Residual stocks	45,745,000	DOWN	1,023,000	UP	700,000
Four-product stocks	415,465,000	DOWN	480,000	UP	34,865,000
Total imports	1,410,000	UP	163,100	UP	42,700

TOTAL DEMAND—ALL OILS



Price Quotations Change, But Other Factors Influence Actual Sales

PETROLEUM-product prices are as jumpy as a cat on a hot stove. In many cases, price quotations are nominal. In other cases, actual sales may depend on ability or willingness of purchaser to take other products along with the primary product.

Heavy gasoline inventories in the hands of some refiners in the Mid-Continent have tended to put more pressure on spot gasoline sold on the Group 3 market.

Deterioration of the Group 3 gasoline market has been gradual, and the change of price this week does not indicate a sudden drop. There have been rumors of lower prices for several weeks, indicating further softening of the market.

Lower prices now have become rather general in the area served with gasoline moved by the Great Lakes Pipe Line. Any important jobber in the area can buy regular gasoline at 10.75 cents per gallon plus pipeline transportation charges.

Softness in the Group 3 gasoline market has had a definite effect on the distillate market. Movement of kerosine and distillate fuels has been about normal for the season and, for the most part, the general tone of the market is good. But, the low of the spot market is about 0.125 to 0.25 cent under what it should be.

The reason for this abnormal softness is the refiner's desire to move gasoline. Some suppliers in the Mid-Continent have been selling distillate fuels to good gasoline customers at a discount. This inducement is in addition to the reductions in gasoline prices. Now, some of these suppliers hesitate to raise distillate prices to normal levels for fear of losing gasoline sales.

Cooler weather may bring a stronger distillate market. In this case, distillate prices may move up and gasoline prices drop still lower.

Residual fuel with no sulfur guarantee is selling on the Group 3 market for $2.15 a barrel with low-sulfur material about $0.10 a barrel higher. Part of this increase can be credited to the movement of residual to the Gulf Coast over the past few weeks. These shipments drained off any surplus fuel in the Mid-Continent.

On the Gulf Coast, residual fuel would bring $0.25 a barrel over the quoted low of $2.35 if it could be purchased by itself. No residual is being offered on the open market along the Gulf Coast. Any material available can be packaged with gasoline to help move some of the motor-fuel surplus in the area.

About the only gasoline sold for export to Europe has been low-octane material with the exception of a split cargo of 87-octane gasoline and light distillate. In this case, the gasoline is reported to have brought the low of the market for that grade.

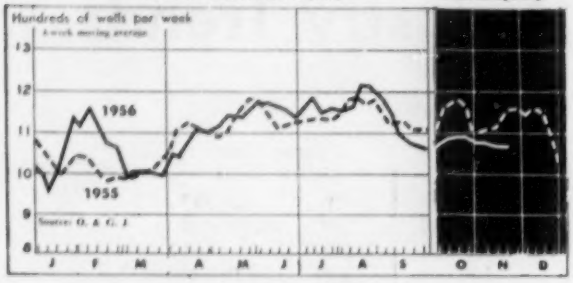
Low quotations for kerosine and No. 2 fuel moved up 0.25 cent a gallon by November 28, but suppliers do not expect any increase in the volume of fuel offered.

The weak gasoline market on the Gulf Coast has influenced sales of natural gasoline in the area. With a big surplus of refinery-produced blending material on hand, Gulf Coast refiners are buying very little natural gasoline. Some suppliers are using more butane to gain the required pressure since a smaller volume is needed to produce the proper blend. Also there is some advantage from improved octane quality of the finished product.

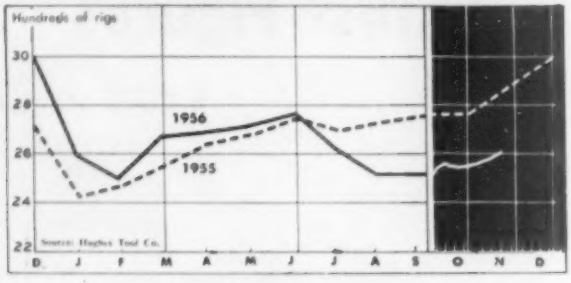
Natural-gasoline prices dropped at the end of October under the influence of Gulf Coast market pressure. Quotations for normal movement of Grade 26-70 are: 4.5 cents a gallon, Group 3, and 4.0 cents, Breckenridge.

It is reported that a few sellers of natural are netting better than 4.5 cents, Group 3, by selling on a delivered basis to refineries where they have an advantage in delivery charges. General sales are at 4.5 cents.

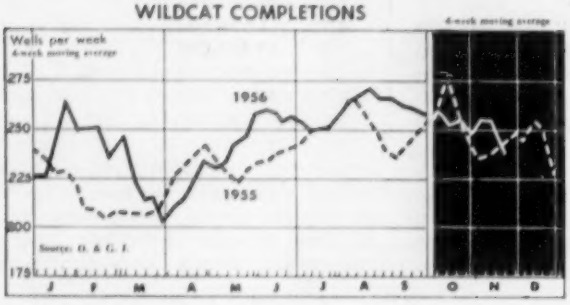
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	11-26-56	11-19-56	11-28-55
North Central and East	103	114	138
Southeast	39	36	38
Okla., Kans., Ark., Mo.	459	444	553
Louisiana	478	488	411
North and East Texas-Panhandle	409	398	407
Gulf and South Texas	260	249	250
West Texas-New Mexico	502	500	582
Rocky Mountain	243	236	303
Pacific Coast	114	117	147
Total United States	2,607	2,582	2,829
Western Canada	250	244	217

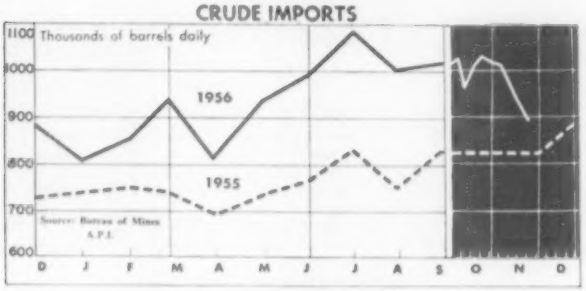
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 24, 1956

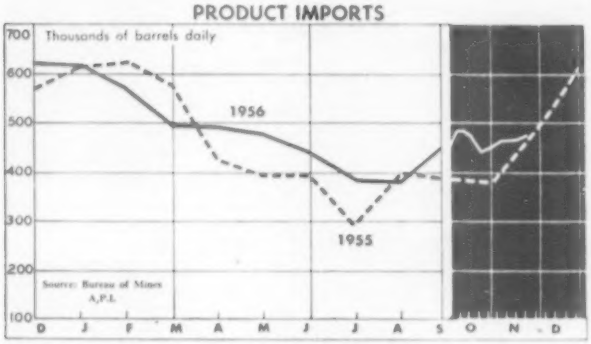
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	18,064	101	68	0	0	0	1	1	0	0	1	43	44
Arkansas	18	13	0	5	56,941	867	739	0	0	0	2	2	32	0	7	128	167
California	37	25	1	11	168,023	1,995	2,204	0	0	0	10	10	46	0	9	409	464
Colorado	25	2	4	19	117,778	1,093	1,342	0	0	2	14	16	24	0	17	555	596
Illinois	67	27	2	38	138,853	3,530	3,528	0	0	0	14	14	46	0	4	643	693
Indiana	19	9	0	*10	30,282	646	655	0	0	0	3	3	16	0	1	113	130
Kansas	77	34	2	†41	275,855	4,451	4,534	0	0	0	10	10	113	4	39	810	966
Kentucky	42	17	3	22	55,625	1,728	1,455	1	0	0	7	8	39	0	1	352	392
Louisiana	59	33	8	18	442,318	3,430	3,664	3	0	1	9	13	107	48	55	485	695
North	24	12	6	6	86,397	1,507	1,901	0	0	0	4	4	31	2	3	201	237
South	25	13	2	10	266,235	1,545	1,763	2	0	1	5	8	61	40	38	252	391
Offshore	10	8	0	2	89,686	378	...	1	0	0	0	1	15	6	14	32	67
Michigan	5	2	1	2	17,002	392	478	0	0	0	1	1	9	0	2	138	149
Mississippi	6	3	0	3	45,942	395	413	1	0	0	1	2	16	1	1	175	193
Montana	9	5	0	4	47,538	424	364	0	0	0	3	3	11	0	1	152	164
Nebraska	12	5	0	7	66,903	848	796	1	0	0	6	7	36	0	1	385	422
New Mexico	33	22	6	5	164,136	1,725	1,537	2	0	0	1	3	49	1	9	187	246
Northwest	8	1	6	1	37,364	762	530	0	0	0	0	0	12	0	7	68	87
Southeast	25	21	0	4	126,772	963	1,007	2	0	0	1	3	37	1	2	119	159
North Dakota	7	2	0	5	46,290	242	236	0	0	0	4	4	8	0	0	65	73
Ohio	32	21	7	4	77,989	984	1,107	0	0	0	0	0	2	0	4	6	12
Oklahoma	134	82	4	‡48	473,097	7,433	7,723	2	1	0	8	11	116	19	34	614	783
Pennsylvania-New York	6	0	6	0	18,461	966	1,364	0	0	0	0	0	0	0	14	17	31
Texas	411	272	13	126	1,892,064	19,754	18,280	11	0	5	72	88	677	31	180	4,147	5,035
Southwest (1 & 4)	52	27	2	23	209,676	2,801	2,811	1	0	0	15	16	121	6	61	790	978
Gulf Coast (2 & 3)	65	29	7	29	445,521	2,387	2,301	0	0	4	18	22	60	16	68	637	781
East (5 & 6)	26	15	0	11	149,475	1,059	899	1	0	0	8	9	15	2	6	361	384
N. Central (7-B & 9)	120	68	1	51	433,079	7,005	6,801	7	0	1	28	36	297	0	12	1,642	1,951
West (7-C & 8)	125	114	0	11	587,663	5,312	4,505	2	0	0	2	4	166	0	11	650	827
Panhandle (10)	23	19	3	1	66,650	1,190	963	0	0	0	1	1	18	7	22	67	114
Utah	4	3	0	1	22,858	128	80	1	0	0	1	2	11	0	5	64	80
West Virginia	16	0	13	3	45,102	622	592	0	0	0	0	0	0	0	11	9	20
Wyoming	17	11	2	4	71,195	813	882	0	0	0	3	3	17	0	10	221	248
Miscellaneous	0	0	0	0	0	71	58	0	0	0	0	0	4	0	0	60	64
Total United States	**1,038**	588	72	378	4,292,316	52,638	52,039	22	1	8	170	**201**	1,379	104	406	9,778	11,667
Total previous week	1,069	556	65	448	4,511,496	...	...	25	0	9	217	251	1,357	103	398	9,609	11,467
Total Nov. 26, 1955	1,106	610	81	415	4,388,427	...	...	41	3	6	191	241	1,483	195	313	9,163	11,154
Cumulative 1956	52,638	28,248	3,683	20,707	211,470,999	...	...	...	...	...	...	...	...	...	...	...	...
Western Canada	64	34	8	22	304,698	2,933	...	...	...	...	...	...	...	...	...	...	...

Service wells included: *1, †2, ‡12.

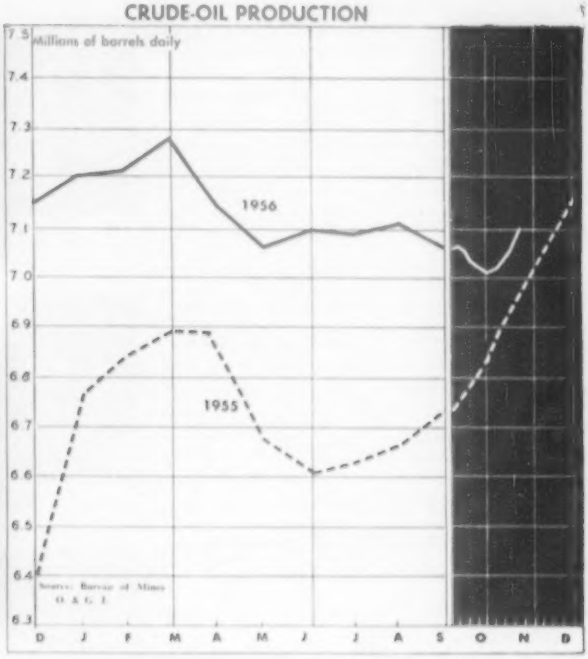
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

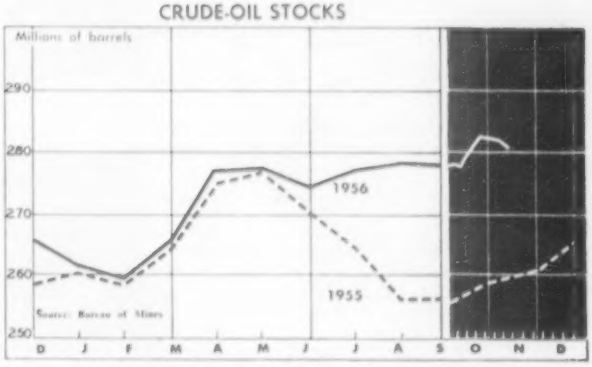


DAILY AVERAGE PRODUCTION FOR WEEK

	November 24, 1956			Nov. 17
	Crude oil	Lease condensate	Total	total
Alabama	11,300		11,300	11,200
Arkansas	79,100	400	79,500	78,100
California	951,300		951,300	952,200
Colorado	155,800		155,800	150,700
Eastern	50,200		50,200	50,500
Florida	1,275		1,275	1,275
Illinois	233,900		233,900	240,800
Indiana	31,700		31,700	32,000
Kansas	336,900		336,900	341,300
Kentucky	45,200		45,200	46,800
Louisiana	777,450	66,500	843,950	831,950
North	128,800	2,500	131,300	119,300
South	648,650	64,000	712,650	712,650
Michigan	28,800		28,800	29,700
Mississippi	108,950	5,000	113,950	113,950
Montana	59,700		59,700	58,800
Nebraska	37,900		37,900	38,700
Nevada	200		200	200
New Mexico	245,325	4,200	249,525	250,425
North Dakota	34,900		34,900	36,200
Oklahoma	†600,300		†600,300	†586,300
Texas	2,951,600	54,500	3,006,100	3,006,100
Dist. 1	57,000	550	57,550	57,550
Dist. 2	145,000	8,600	153,600	153,600
Dist. 3	417,000	26,000	443,000	443,000
Dist. 4	226,000	6,500	232,500	232,500
Dist. 5	39,000	450	39,450	39,450
Dist. 6	124,000	6,000	130,000	130,000
East Texas Field	202,600		202,600	202,600
Dist. 7-B	155,000	45	155,045	155,045
Dist. 7-C	172,000	3,900	175,905	175,905
Dist. 8	1,099,000	1,600	1,100,600	1,100,600
Dist. 9	210,000	650	210,650	210,650
Dist. 10	105,000	200	105,200	105,200
Utah	8,000		8,000	7,700
Wyoming	293,800		293,800	294,600
Others	‡100		‡100	‡100
Total U. S.	7,043,700	130,600	**7,174,300**	7,159,600
Change from previous week, up			**14,700**	
Canada	†514,000		†514,000	†492,700
Total U. S. production, January 1-November 24			2,344,939,750 bbl.	
Same period last year (crude plus cond.)			*2,221,027,088 bbl.	

*Includes 37,019,700 bbl. condensate. †Week ended previous Monday. ‡S. Dakota.

CRUDE-OIL STOCKS



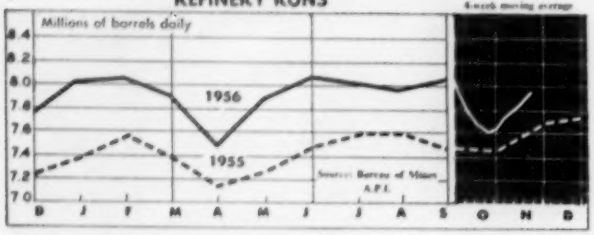
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

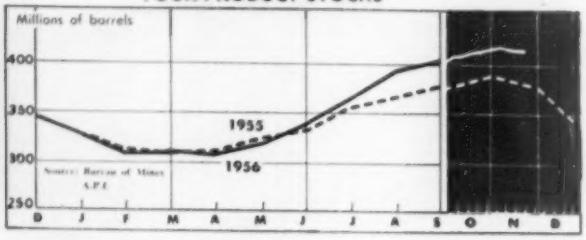
	11-17-56	11-10-56	11-19-55
Pennsylvania Grade	2,419	2,430	3,096
Other Appalachian	2,272	2,315	1,941
Illinois, Indiana, Michigan	11,568	11,858	9,277
Nebraska, North Dakota	2,518	2,389	2,313
Kansas	10,501	10,283	7,855
Oklahoma	23,907	23,916	21,617
Arkansas	2,907	2,894	2,200
Louisiana	17,626	18,366	15,981
North	2,418	2,614	2,527
South	15,208	15,752	13,454
Mississippi	3,295	3,114	2,951
New Meexico	8,535	9,433	7,328
Texas	129,524	128,227	122,689
East Texas proper	8,980	8,912	9,175
West Texas	63,032	61,742	57,541
Texas Gulf	24,293	25,045	24,680
Other Texas	33,219	32,528	31,293
Wyoming	17,111	16,515	14,908
Other Rocky Mountain	6,613	6,507	5,926
California	28,916	29,332	26,274
Foreign	†12,509	14,324	11,183
Total	280,221	281,903	255,539

*Bureau of Mines. †Includes 2,966,000 bbl. in California.

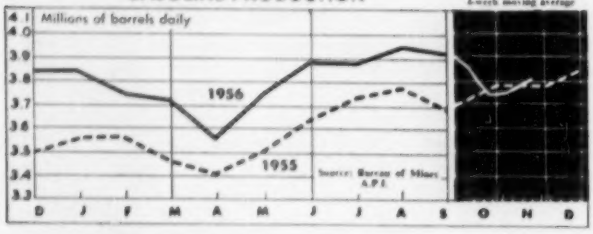
REFINERY RUNS



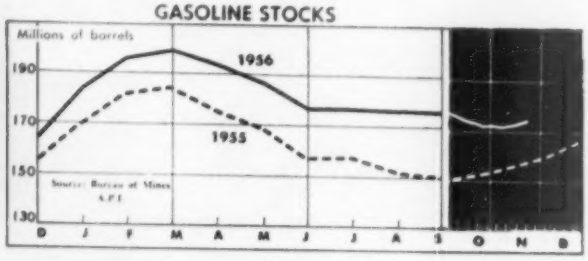
FOUR-PRODUCT STOCKS



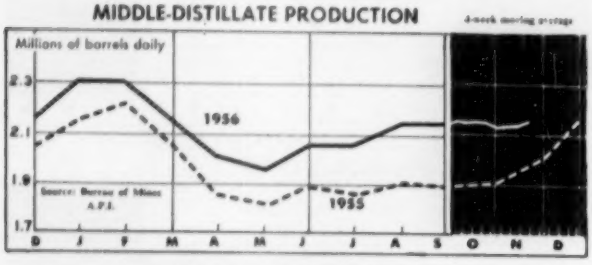
GASOLINE PRODUCTION



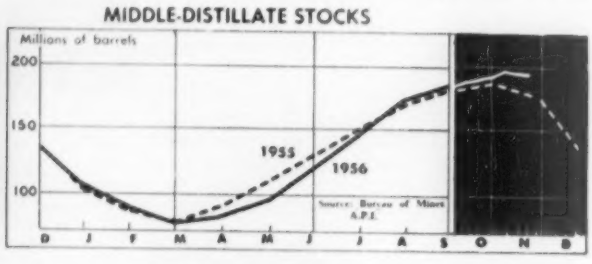
GASOLINE STOCKS



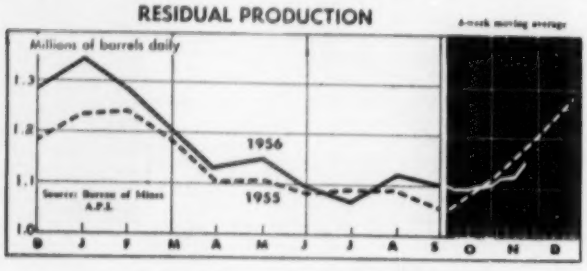
MIDDLE-DISTILLATE PRODUCTION



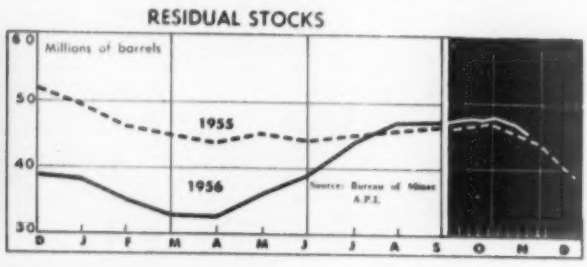
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, NOVEMBER 23, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1955—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,112	445.0	43.2	279.2	214.2	41,220	14,510	61,259	11,839	1,102	428.0	27.6	267.4	222.9
Appalachian:														
District 1	104	40.6	7.1	26.9	10.3	4,511	688	3,675	495	112	46.1	5.5	21.1	8.2
District 2	111	60.4	7.3	22.3	15.6	2,880	758	1,201	228	91	50.7	3.8	18.1	12.5
Ind., Ill., Ky.	1,477	768.2	93.7	288.0	212.4	29,348	7,874	25,335	6,013	1,375	751.2	73.3	272.1	192.8
Minn., Wis., Dak.	101	50.0	5.1	28.9	7.7	7,135	1,801	8,799	123	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	671	368.4	19.6	160.4	26.0	14,313	1,933	13,621	1,473	693	406.2	17.8	162.9	34.9
Inland Texas	256	191.9	6.0	49.1	15.6	6,973	521	2,206	1,810	251	186.8	9.8	47.2	19.0
Texas Gulf Coast	1,974	889.1	116.4	495.6	254.7	25,300	3,629	15,945	6,570	1,940	907.8	137.3	481.2	255.1
La. Gulf Coast	724	366.4	92.6	161.1	48.9	10,846	2,886	7,364	1,583	688	357.8	54.8	165.3	48.1
N. La. and Ark.	105	40.9	10.0	22.1	5.7	4,465	984	2,322	296	97	36.7	6.4	24.9	6.7
Rocky Mountain:														
New Mexico	25	13.7	0.6	5.0	4.1	542	8	126	70	22	11.0	0.4	3.9	2.6
Other Rocky Mtn.	263	127.0	5.0	61.4	30.4	4,982	386	3,249	941	256	122.8	4.3	62.0	42.3
West Coast	1,188	469.3	1.3	223.0	362.7	22,029	327	13,769	14,304	1,065	482.7	.....	153.7	368.6
Nov. 23, 1956	8,111	3,830.9	407.9	1,823.0	1,208.3	174,544	36,305	158,871	45,745	7,692	3,787.8	341.0	1,679.8	1,213.7
Nov. 16, 1956	7,965	3,783.3	374.1	1,737.9	1,127.3	172,739	35,978	160,460	46,768	.....	.....	.....	.....	.....
Nov. 25, 1955	7,741	3,743.0	342.3	1,692.0	1,228.6	155,866	34,315	145,374	45,045	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois, Kentucky district.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (88 octane)	10.75-11.50
★ Premium (96 octane)	12.50-13.25
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California (rack):	
★ Regular (84 octane)	12.35-12.6
Premium (93 octane)	13.4-13.6
Premium (96 octane)	14.6
Caribbean area (cargoes):	
Regular (87 octane)	10.00
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.875-10.00
Diesel oil (58 d.i. and above)	9.50-9.75
Distillate No. 1	9.50-9.75
Distillate No. 2	8.875-9.00
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.75-10.25
★ Distillate No. 2	9.25-9.75
New York Harbor (barges):	
Kerosine 41-43	11.25
Distillate No. 2	10.65
Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
★ Distillate No. 2	9.0-9.25

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$2.25-2.40
Gulf Coast (cargoes):	
★Bunker C fuel	$2.35-2.60
New York Harbor (barges):	
Bunker C fuel	$3.05
Caribbean (cargoes):	
★Bunker C	$2.35
California (rack):	
★ Bunker C fuel, Los Angeles	$2.50

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	★Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.42				
15-15.9	2.46				
16-16.9	2.49				
17-17.9	2.53				
18-18.9	2.57				
19-19.9	2.60				
20-20.9	2.64	$2.50		$2.37	
21-21.9	2.68	2.52		2.39	
22-22.9	2.72	2.54		2.41	
23-23.9	2.76	2.56		2.43	
24-24.9	2.80	2.58	$3.01	2.45	
25-25.9	2.84	2.60	3.03	2.47	$2.13
26-26.9	2.88	2.62	3.05	2.49	2.19
27-27.9	2.92	2.64	3.07	2.51	2.24
28-28.9	2.97	2.66	3.09	2.53	2.29
29-29.9	3.02	2.68	3.11	2.55	2.34
30-30.9	3.07	2.70	3.13	2.57	2.39
31-31.9	3.13	2.72		2.59	2.44
32-32.9	3.19	2.74		2.61	2.48
33-33.9	3.25	2.76		2.63	2.52
34-34.9	3.31	2.78		2.65	2.56
35-35.9	3.36	2.80		2.67	2.60
36-36.9	3.40	2.82		2.69	2.64
37-37.9	3.43	2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold Texas, North Louisiana, Arkansas. ‡Low-cold-test Gulf. ‡Sour.

Effective dates: California, November 19, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	2.90
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.35
Lagunillas heavy, flat, Amuay or Las Piedras§	2.20
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡2.05

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., dirty (USMC+195%)	$8.41
★ N.W.I.-U.S.N.H., dirty (scale+265%) (61s. 9d.)	8.59
★ N.W.I.-U.K., clean (scale+370%) (152s. 9d.)	21.26
N.W.I.-U.K., dirty (scale+325%) (138s. 2d.)	19.23
★ P.G.-U.K., dirty (scale+350%) (358s. 2d.)	49.84
P.G.-U.K., dirty (scale+325%) (338s. 3d.)	47.07

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FOR SALE: One 1956 Model 970 GMC 200" WB Diesel Tractor with Winch, Fifth Wheel, with 29' Tandem Trailer. One Allis-Chalmers HD 15 Tractor, Serial 2828 with Baker 15X Bulldozer with Carco Model GO Winch and Headache. B. L. Rucker Drilling Co., Phone: 1072; Res. 480, Mt. Vernon, Illinois.

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Gardner-Denver—Two stage 13" stroke completely unitized on steel skids & powered with 6LRO Waukesha Engine. This unit complete in every respect. Used approximately 8 months and a real bargain. Ready to go to work.

Worthington—Type HB, 11" stroke single stage horizontal compressor unitized on steel skids. Powered by 145GZBU Waukesha Engine & complete with V-Belt drive, guards & necessary controls. This unit ideal for that smaller lease operation and a steal at our bargain price.

Fuller—Rotary compressor type B-60H mounted on steel skids & direct connected to Model 145GKU Waukesha Engine. Compressor ratio 1.5 to 1. This unit used very little and available for immediate delivery.

Clark Brothers—Model HMA6 angle units complete with Young coolers and all fittings. Six power cylinders 8¼x8¼, 200 hp at 600 rpm. Gas cylinders, two 14½ and one 10½. Capacity, 1,500,000 CFD at 0# suction. We have two units of this type in practically new condition immediately available and priced at a bargain.

Cooper-Bessemer—Model GMXA angle compressor complete with Young cooler and all fittings. Four power cylinders 9¾x10½, 250 hp at 400 rpm. Two gas cylinders, one 20" and one 10¾". Capacity 1,500,000 CFD at 0# suction. This unit used very little and practically new.

Most of the above units may be inspected in our plant in Oklahoma City, and are offered subject to prior sale. We have many others not listed and we invite your inquiries.

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BUCYRUS ERIE 36L with Standard mast reinforced, GK 145 Waukesha motor, Casing line & Blocks, and dog house. Stansylvania Oil & Gas Co. Box 311. Borger, Texas.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

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6—Brown fintube exchangers, 300# 140 sq. ft. 4-6 chrome.
1—5' x 96' tower, 40 tray, 135# WP.
1—6' x 34' Vacuum tower, 150#.
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2—8½' x 25' Tanks 50#.
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3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
3 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—385' hd.
1 Pacific HVTB (unused) 1270 GPM—409' HD.

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2700, 2200, 1800 Sq. Ft.
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385 CFM 160 lbs.

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RES.: FLanders 1-8152

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1 CARDWELL & 1 Brewster double drum spudder; 1 Wilson "senior" single drum pulling unit mounted on Dodge truck. Complete set of tools and accessories with each unit. Davon Oil & Gas Co., Box 1586, Oklahoma City.

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Joe Braddick, FAirfax 3-2401, Houston, Texas
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Mail confidential, complete chronological resume, including education and employment (names and addresses of employers, dates employed, positions held and scope of responsibility, salaries received, nature and location of projects estimated and supervised, etc.) to Personnel Department.

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Wynnewood, Oklahoma. Experience with atmospheric and vacuum distillation units, catalytic polymerization, U.O.P. Fluid Catalytic Cracking, catalytic reforming, and asphalt units desired. Starting salary commensurate with experience and ability. If interested, please submit a resume to Mr. R. M. Chesney, Kerr-McGee Oil Industries, Inc., 306 N. Robinson, Oklahoma City, Oklahoma.

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ADMINISTRATIVE GEOLOGIST: 37, 13 yrs. exp. 10 years Adm., Exec., Personnel Mgr. Thoroughly acquainted all phases Geol. degree, grad. studies, legal training Wide exp. Rocky Mts., Texas, Canada, Mid Continent, Ill.-Ind., N. Mex.; presently attending law school. Available 90 days. Seeks permanent position. Box 339, Valparaiso, Indiana.

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WANTED: Production West Central Texas. Send complete details. Texas Canyon Oil Company, 1209 Texas National Bank Building, Houston, Texas. Phone: CApital 7-5184.

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Land Title Restudied

Wyoming is reconsidering lease offers by Richfield

CHEYENNE, Wyo. — The Wyoming Land Board is reconsidering an application denied Richfield Oil Corp. for oil leases on a section of land in Big Horn County.

Last August, State Land Commissioner Ben Cossman rejected Richfield's lease offer after Atty. Gen. George Guy ruled the state didn't own the land. Richfield appealed to the land board.

The controversy revolves around an act of 1890 under which Wyoming became a state. Sections 36 and 16 of each township were granted to the state for school purposes. The land sought by Richfield was not then in Section 36 but was placed there in a resurvey made in 1907.

The attorney general's office is now reconsidering the opinion that the state didn't own the land and will issue a new opinion to the land board. The state took its original position, Guy explained, "because cases studied for precedence in this matter said a resurvey cannot change or limit acreage received in a grant or patent."

The attorney general said that in a similar case in California, the State Land Board claimed ownership of such land and was upheld by the Ninth U. S. Circuit Court of Appeals.

More Steel Sought

ODM studies expansion for plate and tubular material

WASHINGTON.—A new expansion program for steel plate and oil-country tubular goods production may be approved before the end of the month.

The Suez situation and the Government's concern over tankers are big factors in the studies on which Molibization Director Arthur S. Flemming will make his decision.

Over the past few months, applications for fast tax amortization of new steel plant amounting to nearly $2 billion have been filed with the Office of Defense Mobilization. Except for plate and tubular goods, however, it is unlikely that action will be taken before the first of the year.

Steel companies pressing for action present strong arguments for expansion programs.

If the United States is required to supply Europe with oil for any great length of time, as seems likely, increased drilling will continue indefinitely. Present plants will be totally unable to keep up with demand.

Tanker situation . . . But the tanker-steel situation is even more serious. Demand for plates has run ahead of supply for months. And the boom in tanker building is just starting.

American shipyards have 23 tankers building or on order now. The Maritime Administration announced last month it had proposals for 31 vessels and more have since been received.

On top of this almost certain construction, the administration called last month for study of a tanker program totaling at least 50 ships. This alone would call for 1,000,000 tons of steel, 750,000 tons of it in the form of plates.

Many steel plants are operating at above capacity now.

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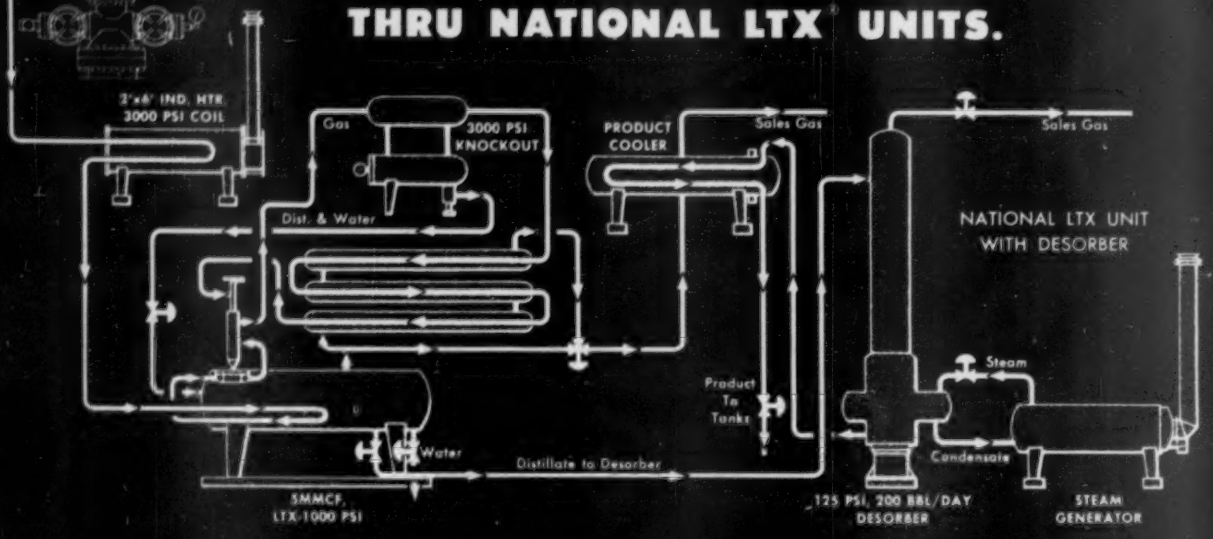

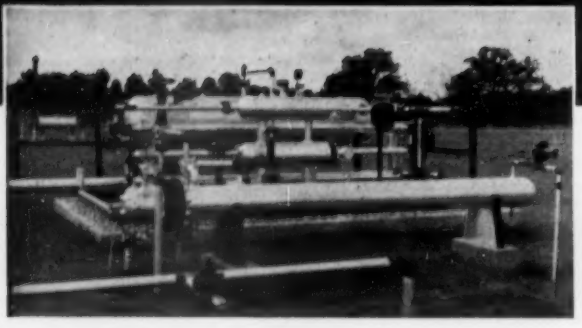

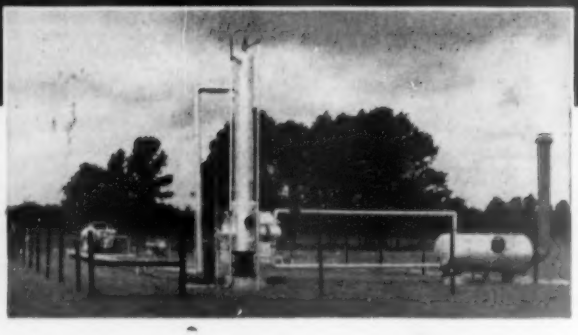

Installation of a National LTX Unit with desorber on this gas distillate well near Shreveport, Louisiana, INCREASED the recovery 14 barrels of stock tank liquid per MMCF of sales gas produced.* The well originally tested 70 barrels per MMCF with conventional separation equipment and increased to 84 barrels per MMCF of sales gas produced after the installation of LTX equipment. The LTX unit operates at approximately 300 psi and 5°F. Flowing pressure is approximately 2500 psi.

To receive maximum recovery from your lease, contact a National Tank Company representative in your area. You will find him nearby with "know how" and production equipment ready to serve your producing needs.

**For a more finite economic evaluation, the differences in recovery should be based on the unit of well effluent. This is not data that can easily be observed in the field for it requires calculations based on the wellstream hydrocarbon composition. Such determinations are often valuable.*

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TULSA, OKLAHOMA

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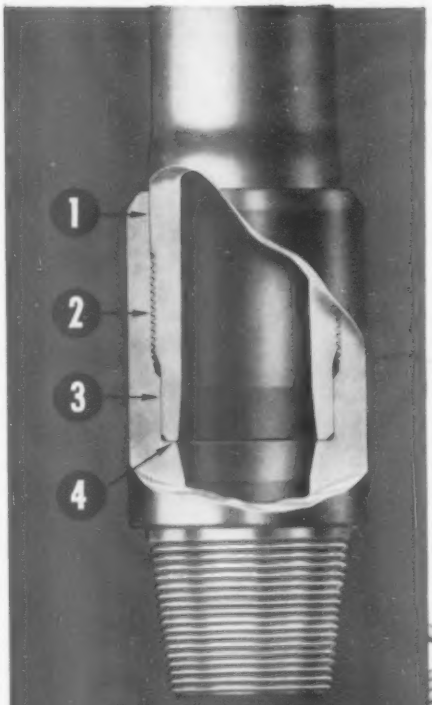

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